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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

The One-Man Tank
See Page 819

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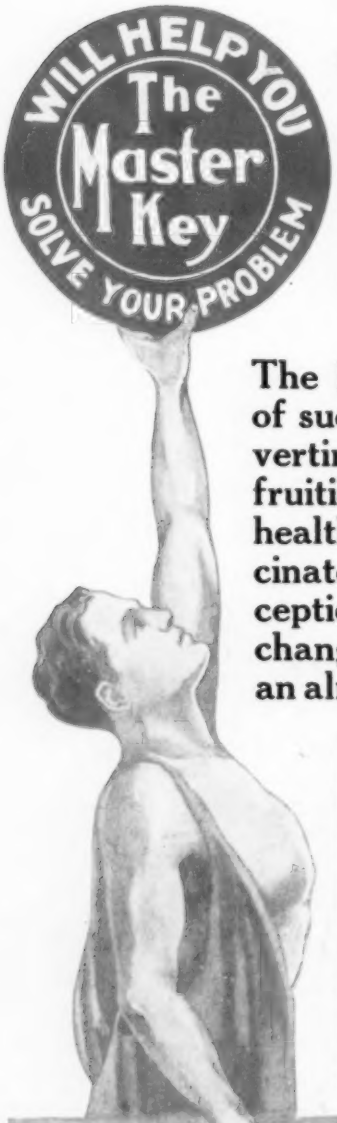

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Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 29 JUNE, 1918 No. 6

Railway Skates Are New Seven-League Boots

TRACK skates have made their début. They are intended for sporting purposes and also as aids to the individual who is more or less dependent upon his legs for long-distance transportation. Except for the fact that the wheels are supplied with flanges that hold them to the top of a rail, the skates are not greatly unlike those commonly encountered on town and city sidewalks. To enable one to maintain equilibrium while making successive strokes, a balancing rod is provided. This is shaped somewhat like the handle of a scythe and is equipped at its outer end with a flanged roller that is held to the opposite rail. Fair speed without undue exertion is easily maintained on a level track. On a sharp down grade there is also, of course, excellent opportunity for exhilarating coasting—and thereafter a long walk back to the starting point.

Railway Roller Skates Enable One to Cover Considerable Mileage in a Short Time on Level Tracks. A Fair Rate of Speed is Easily Maintained When One Gets the Knack of Skating in a Straight Line

GASOLINE MOTORS SHIPPED KNOCKED DOWN TO USERS

For years furniture, boats, houses, and other things have been sold knocked down. Now the same idea has been applied to marine motors.

Above: Opening the Case, Showing Orderly Way in Which the Various Parts of the Engine are Grouped

Below: Assembling the Motor by Putting Numbered Parts Together in the Order Indicated by the Instruction Sheet

Keying the Flywheel; the Motor Assembled and Nearly Ready to be Tested and Placed in Service: By Assembling a Motor a Novice Learns Enough of Its Construction to Enable Him to Treat It Intelligently When It is Placed in Operation

One and two-cylinder gasoline engines of simple construction are being consigned to purchasers disassembled. The various parts are wired in place to the inner walls of a square box that, when opened, forms a large cross on which everything is intelligently arranged. Elaborate instructions for assembling, finishing, and testing the motor are provided. The parts are numbered in the order in which they should be placed together, and the numerals correspond to those accompanying illustrations on the instruction sheet. It is claimed that the system has been so thoroughly worked out that any person, whether "mechanically inclined" or not, can assemble the motor in four hours. As in the case of knocked-down furniture, the purpose of the idea is moderate cost. With the motor, however, there is another advantage. The novice who has once completely assembled an engine, before beginning to operate it, is thoroughly familiar with its construction and therefore fairly capable of taking care of the mechanism.

OIL AND GREASE CONSERVED AT BRITISH GARAGES

Fully 80 per cent of the amount of kerosene formerly used at garages and service stations in England for cleaning motor vehicles is now saved by employing a weak solution of hot caustic soda. Also the grease that is removed from axles, wheels, gear boxes, and other parts, is salvaged, and even the rags utilized in the work are reclaimed by at least one company that operates many stations in London. When the parts have been dismantled they are placed in a tank of boiling water to which enough caustic soda is added to make about a three-per-cent solution. After the grease has risen to the top of the water, it is drawn off, and the rack holding the parts is transferred to a tank of fresh boiling water in which the cleaning is completed. The grease is then reclaimed by boiling.

TREASURE CHEST USED IN WAR-FUND CAMPAIGN

SUPPORTED on the heads of four gilded lions, this treasure chest, a big replica of the type carried years ago by seafaring men, has been employed for publicity purposes in a campaign launched at Salem, Massachusetts, to raise a **$400,000** sum from which to make contributions to various war-relief funds during the present year. The chest is 16 ft. long, 10 ft. wide, and 8 ft. deep.

FAMILY TRAVELS NIGHT AND DAY IN AUTO

A family recently fitted up a touring car so that on a vacation trip it was possible for them to travel day and

Equipped to Travel 24 Hours per Day: Cushions and Seats Rearranged to Furnish Sleeping Accommodations for Three

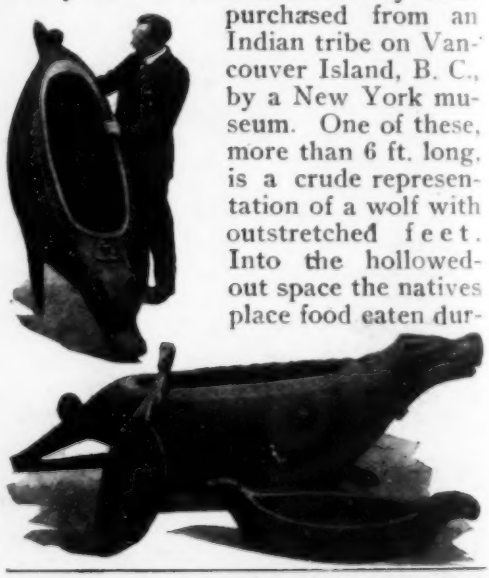
night when their schedule so required, one person driving while the others slept. The right-hand front seat was removed, making reclining room for one adult and two children.

FLOTATION OF COPPER ORES WITH COMMON SALT WATER

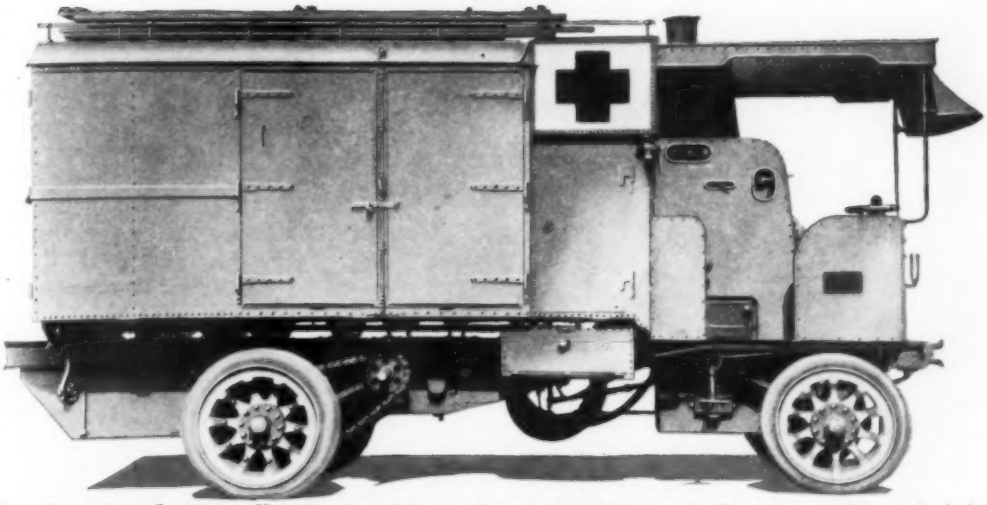
Surprising results have accompanied recent experiments in the flotation concentration of copper ores without the use of oils or similar products. Much has yet to be done to establish definitely the range of applicability of the method. It represents a significant departure from standard practice and apparently turns the proverbial bull loose in the china shop of pet theories. Work already accomplished, however, shows undeniable promise for the process, which essentially consists in the agitation and aeration of ore pulp that has an electrolyte in solution. Discovery of the possibility of this scheme was made about a year ago when commercial waterglass was used in a laboratory test. Subsequently it was found that similar results were to be obtained through the use of a salt solution. In employing ordinary sea water without the addition of a reagent, a small quantity of concentrate assayed 21.61 per cent copper, 34.3 per cent iron, 31.2 per cent sulphur, 6.4 per cent insolubles; an equal amount of middling showed .71 per cent copper, 34.9 per cent iron, 16.2 per cent sulphur, 26 per cent insolubles, and tailing assayed .09 per cent copper, 15.2 per cent iron, 2.6 per cent sulphur, and 56.6 per cent insolubles.

HUGE WOODEN DISHES USED IN INDIAN CEREMONIES

Wooden victual dishes of extraordinary dimensions have recently been purchased from an Indian tribe on Vancouver Island, B. C., by a New York museum. One of these, more than 6 ft. long, is a crude representation of a wolf with outstretched feet. Into the hollowed-out space the natives place food eaten during tribal ceremonies, employing also a huge wooden ladle. Another dish in the collection is smaller, with crude eagle heads for handles.



Above: Mammoth Indian Ceremonial Dish in Which Soup is Warmed by Dropping In Red-Hot Stones. Below: The Larger Dish Represents a Wolf and the Smaller One is Adorned with Eagle Heads—Both Symbols of Clans

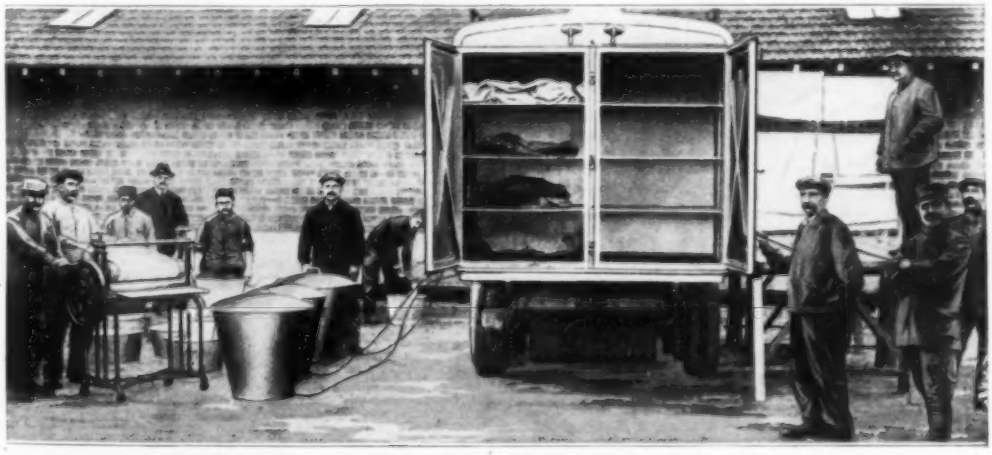


Side View of the Sanitation Unit Purchased by the City of Philadelphia to be Placed at the Disposal of the 108th Artillery, Formerly the City's Second Infantry Regiment

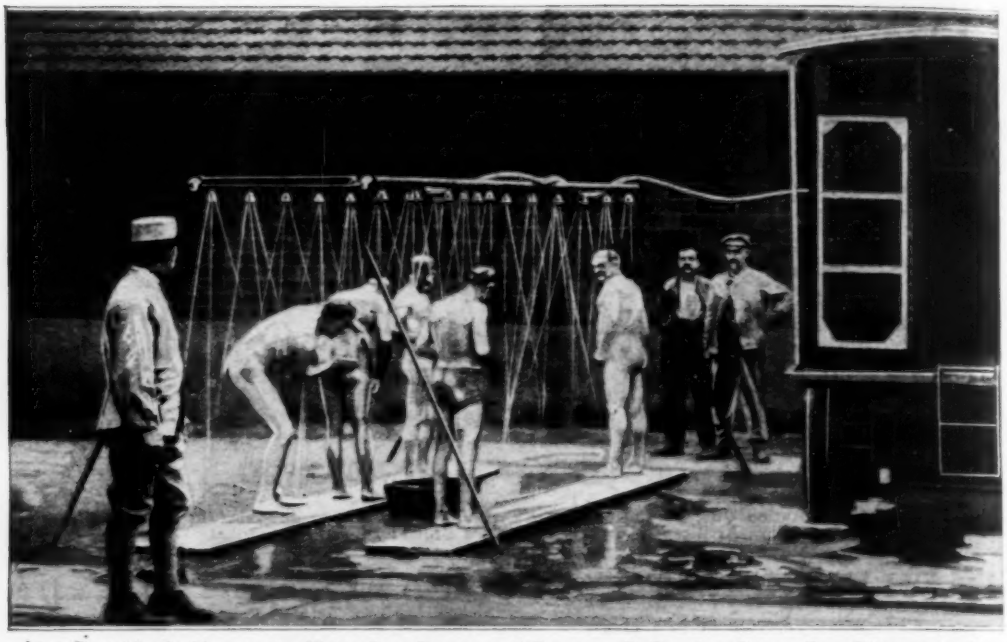
BATH WAGONS TO ACCOMPANY PHILADELPHIA TROOPS IN SERVICE

IN so far as she is able Philadelphia has taken substantial steps, acting through her city councils, to look after the cleanliness and bodily comfort of her soldiers in France. With this object in view the councils have just authorized the purchase of what is known as the sanitary wagon, a motor-driven machine, which is of French design, patent, and manufacture, at a cost of $9,000. It is to be placed at the disposal of the 108th artillery regiment, formerly the second regiment of infantry of Philadelphia.

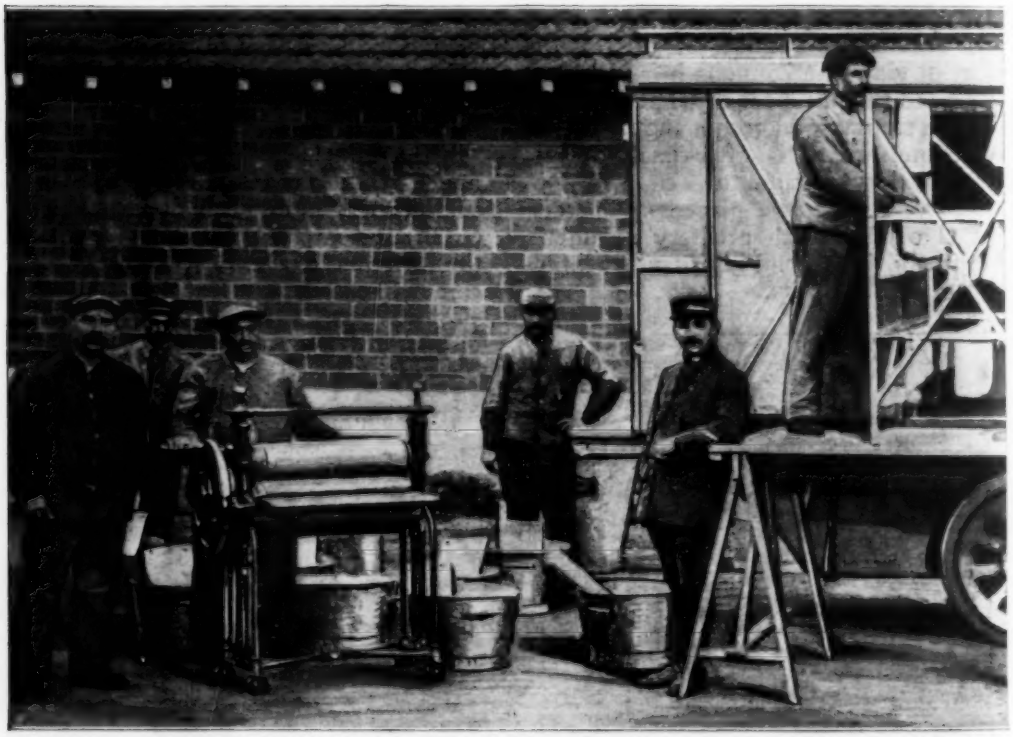
The councils were led to interest themselves in the bodily comfort of the city's soldier boys by information which they received from military officers who had been in France. These officers told of the very great difficulty which the soldiers had to contend with in order to keep even tolerably clean. "In the trenches," said one of these officers, "there are two things which the soldiers fear more than they do bullets or shells—rats and vermin, especially the latter. The rats they can keep somewhat under control, but vermin is



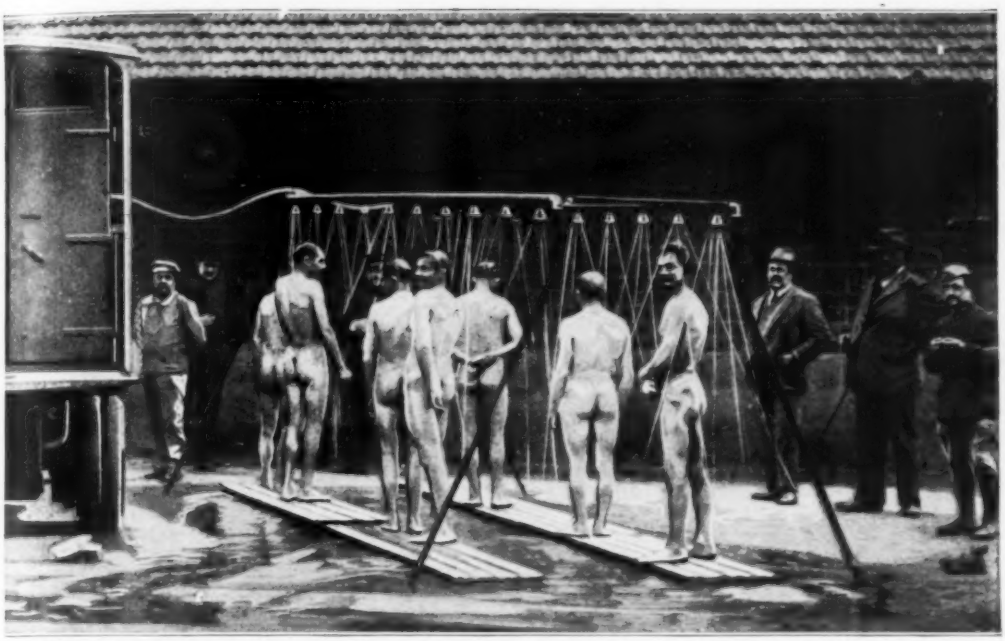
Rear Doors Opened, Showing Fumigating Compartments Connected with Tanks at One Side Containing Disinfectants: The Open-Air Drier Is Visible at the Right, Supported on a Table



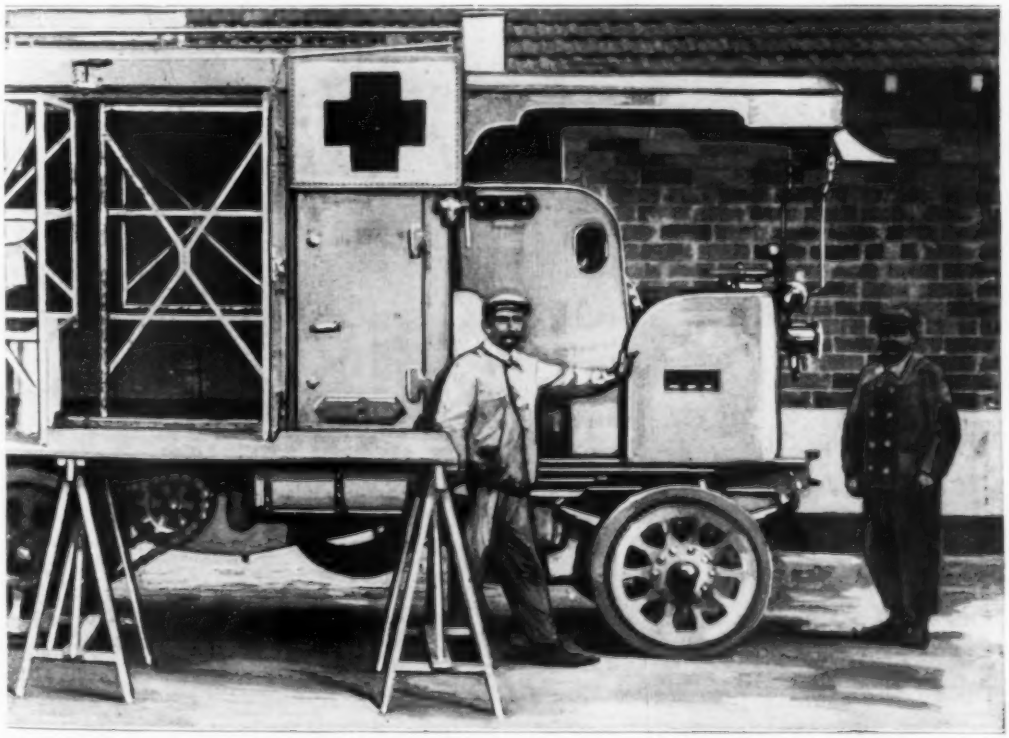
As a Portable Bathhouse, the Motor Is a Pronounced Success. It Requires But a Few Minutes to Erect While the Soldiers Bathe, Their Clothing is Washed, Dried, and Fumigated, So That To Us at Home, Removed from Mud, Filth, and Vermin, Substitution would Seem a Hardship. To the Fellows "Over



The Laundry Equipment in Use, the Drying Racks on a Table Supported by Wooden Horses at One Side: and Represents an Investment of $9,000. One has been Ordered and Others will be Good Spirits, and Morale Are as Necessary for the Military Success of the Chance for Cleanliness, However, Preservation



the Overhead Pipe Systems, Connect Them with the Water-Supply Tank, and Have Things in Operation. When They Leave They Are as Clean from Skin Out as Soap and Water can Make Them. of a Portable Unit Such as This for the Facilities We Now Enjoy There." However, Such Equipment Is a Godsend



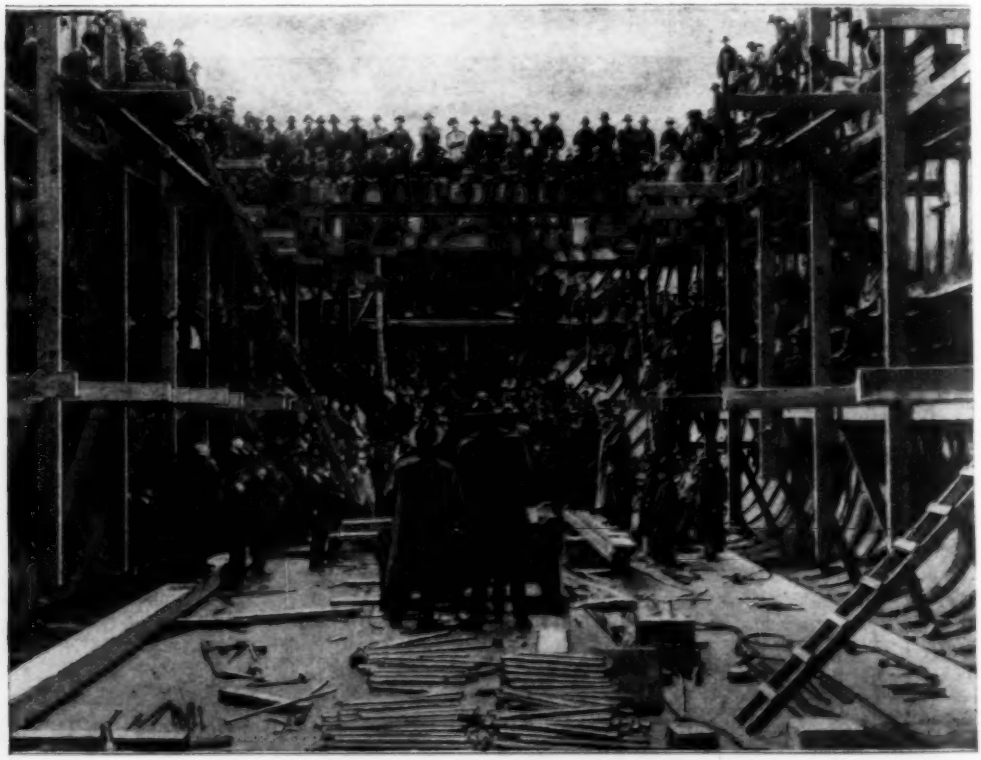
Tubs, a Mangle, and Other Paraphernalia Are in Evidence. The Unit Is of French Design and Manufacture Obtained So That the Needs of All of Philadelphia's Soldiers will be Met. Health, a Modern Army as Nerve, Ammunition, and Fighting Skill. Lacking of the First-Mentioned Qualities Is Difficult

much more troublesome in view of the fact that the soldiers have no means, near enough to be serviceable, of bathing or keeping their clothes clean."

The sanitary wagon is used by the French at some of the hospital bases, but in this capacity it is of little use to the soldier in the trenches. It is constructed entirely of metal and can be driven to any location, irrespective of the roughness of the ground. It is equipped with storage batteries and has not only all the facilities for washing, drying, and fumigating clothing of all kinds, but its equipment includes the accessories necessary for shower baths, 20 or more of them operated simultaneously. With the operation of the sanitary wagon soldiers may undress, take a shower, and while they are so engaged have their clothes washed, dried, and fumigated, all ready for them to don after the bath.

Philadelphia decided to place the wagon at the disposal of her boys "over there" after learning that the Federal government could not go into this phase of the care and maintenance of the soldiers on foreign soil. It is planned by the city to purchase as many of the wagons as may be necessary to meet the needs of all the Philadelphia soldiers "at the front."

In the purchase of the first of the machines the city has had a little more difficulty than is usual in making purchases. The contract governing the purchase had to be prepared first in English and then in French, pass muster through the city's law department and then receive the approval of the War Department at Washington.



UNCOMPLETED SHIP'S HULL SERVES AS AUDITORIUM

ASSEMBLED within the hull of a big wooden steamship under construction in the Puget Sound district, 500 workmen are listening to a talk given by a representative of the Department of Labor. The heavy deck beams were excellent first-row balcony seats and were quickly filled by the early comers.

STOKING ON A BATTLESHIP IN THE WAR ZONE

By LEWIS R. FREEMAN

EXCEPT for the actual lift it receives from a wave, a battleship rolling in a beam sea moves a good deal like an inverted pendulum, so that one feels a minimum of motion when he is down against the skin of a lower hold, and a maximum in the foretop. The transition had been a sudden one for me that morning, for the gunnery lieutenant, who had been initiating me into the secrets of "director firing" in the foretop, brought me back to the main deck and turned me over to the senior engineer, who had volunteered to show me what rough-weather stoking was like.

The big ship was wallowing with that ever-disconcerting "hang" at the end of a roll, such a pause as one never experiences in an ocean liner, which (with no heavy guns and only light upper works) needs no great amount of time to make up its mind as to whether or not it is worth while going to the trouble of getting back on an even keel. As we put one reeling steel ladder after another above us in our descent, the roll decreased as the tumult of crashing waves was stilled to muffled jolts, and, with a flight or two still to go, we were steady enough on our feet to have both hands free to lift the heavy air-tight "flap" of the boiler room. As I ducked under the flap, the damp, clammily clinging air of the decks above was assailed by a sharp blast which, however hot and dry, was still (at least in comparison with the heavy atmosphere of the higher 'tween-decks spaces) fresh and invigorating. Although far from an earthly paradise in a ship on an equatorial run, the stokehold of a battleship that is battened down against heavy winter weather is in some respects the most comfortable spot aboard it. Certainly, the half dozen brawny fellows who sat or lounged against the steel bulkhead of the half of the boiler room into which we had descended, did not look to be having anything like so bad a time of it as an equal number of oilskinned seamen I had seen but a few minutes before, bracing themselves against the seas sweeping the icy forecastle deck, as they tried to repair a smashed ventilator. Grimy they were, to be sure, but otherwise there was little about them to suggest the sweating, stripped-to-the-waist, in-to-the-last-gasp stoker of romance and popular fancy.

Lewis R. Freeman (center), Resident Writer with the Grand Fleet, as He Appeared After Serving a Turn as a Stoker

To one who has pictured the stoker as a gaunt-eyed demon steadily shoveling coal under a boiler for four hours, the first glimpse of the stokehold of a warship that is in no great hurry to get somewhere, will come as a good deal of a surprise. The place is neither especially dirty nor especially hot. Neither the letting the coal slide down by its own weight from the encompassing bunkers nor the cracking up of the occasional lumps which are too large for

even combustion, raises as much dust as the dumping of a single sack upon one of the upper decks. The footing on the grilled-steel plates of the deck is firm and sure, and, as I have said, there is less motion in the stokehold than in any other part of the ship. It might conceivably happen in destroyers, but the stories of men half roasted from being thrown against the furnace doors in storms, do not originate on battleships. But let us see how these comfortable, easy-moving chaps manage to handle the fuel sufficient to send twenty-five or thirty thousand tons of steel hurtling through the seas with so little apparent haste or effort. The running back of a sliding steel door brings a stream of coal running out of one of the bunkers, coal which, dumped from sacks into the entrance of a chute on one of the upper decks, has worked its way downward by gravity as that beneath it has been fed to the furnaces. This stream is caught in a "skip" of steel, shaped like the half of a cylinder and capable of holding something like a couple of hundredweight. Sliding fairly easily over the grilled deck —pushed by one man and pulled by another—the skip loads are dumped evenly along in front of the 12 doors which open—four to each—to the three furnaces under the boilers occupying this half of the stokehold. Now we come to the actual stoking.

A bell suddenly clangs, echoing sharply from the steel walls, and instantly two of the lounging figures quicken to the alert. One scoops up a shovelful of coal and the other steps forward and rests a hand on the lever running to one of the furnace doors. A second or two later, as a number shows on a dial on the wall, the latter pushes the lever sharply, and the door is pressed upward, revealing a glowing bed of fire running back out of sight under the boiler. The shovel is already swinging forward as the door rises, and, missing that steel plate by a fraction of an inch, its contents are discharged—with a quick "wristy" motion that scatters the coal evenly over the fire—into the furnace.

As the shovel is drawn back, the lever is released, permitting the door to fall shut of its own weight. With all possible speed another scoop is filled with coal and the operation repeated, once or twice more, according to the speed which it is desired to maintain. Then the two men relax and stand at ease until another clanging of the bell heralds the number of the next furnace to be fired. Then the door is lifted and the coal thrown in as before, the operation going on until each of the 12 have received their two, three, or four shovels apiece, when—always subject to the indicator on the wall—it begins over again.

If a lump of coal is larger than a man's fist it is cracked up before being thrown into the furnace. As the stoker swings his filled shovel toward the opening door his trained eye is looking for two things—a pronounced hollow in the bed of coals, or a spot in which the duller glow tells him the combustion is considerably advanced. If neither is visible, he gives his shovel a very sharp side flirt and spreads its contents just as widely and evenly as he possibly can. If he observes a hollow, he endeavors to even it up with fresh coal. A burnt-out spot also receives fresh fuel, and if there is evidence of the formation of a crust of clinker, this may be marked for a subsequent cracking up with the "slice," a long steel bar which serves the purpose of a poker. Every effort is bent toward maintaining a smooth, evenly burning bed of coals under all of the boiler.

Automatic regulation of stoking is no new thing on warships, and was even in use on the latest of the Atlantic liners running before the war. The machine most commonly in use by the British is the "Kilroy," and its object is to raise a given amount of steam with a minimum of coal and physical effort.

In order to understand its workings thoroughly one should go first to the engine room, from where it is regulated. The order for a certain speed is sent from the bridge to the engine

"A bell suddenly clangs, . . . and instantly two of the lounging figures quicken to the alert. One scoops up a shovelful of coal and the other steps forward and rests a hand on the lever running to one of the furnace doors."

room, and the engineer sets his Kilroy so that the stoking shall proceed at a rate calculated to produce the necessary steam. The dial of the machine is numbered from 3 to 12, and the number he turns the indicator to—say 7—rings up the numbers of the furnace doors in the boiler room at a rate which will insure that each shall be stoked every seven minutes. The number of shovelfuls of coal to be thrown in at each stoking is determined by consulting, first, the telegraph from the bridge (which registers in both the engine room and stokehold) and then, a table which each stoker knows by heart. The dial of the telegraph is marked as follows: "Keep Steam," "Stop," "Slow," "Half Speed," "Full Speed," "More Steam." The table referred to gives the number of shovels to be thrown on to fulfill the direction on the telegraph dial. Thus "Slow" calls for from two to three shovels of coal; "Full," four to six, and "More Steam," from six to eight.

This plan gives, perhaps, the most perfect control of stoking possible without mechanical handling of the coal, and that is hardly practicable on shipboard. Practically all modern coal-burning ships carry a small supply of oil fuel, which is, however, generally used very sparingly and kept for raising steam pressure quickly in great emergency.

It was while I was being initiated into the technique of stoking by shoveling coal under the boilers at the rate indicated to keep the steam at "Half," that a change of course brought the swinging seas dead abeam and set the

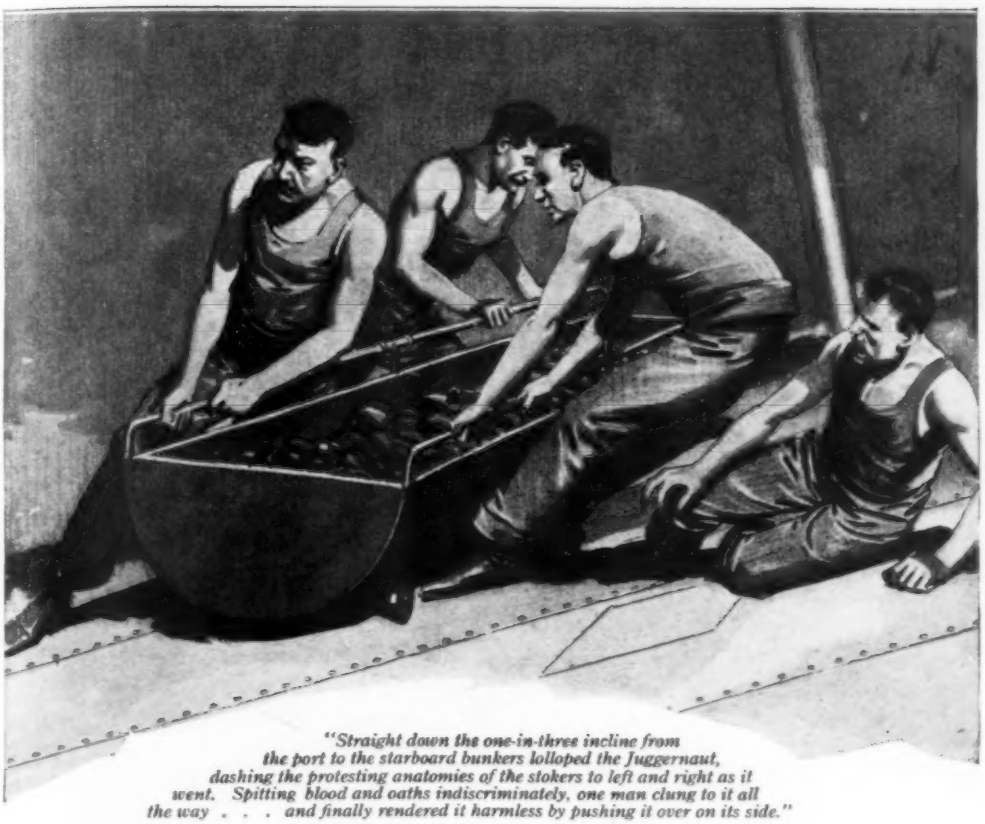
ship rolling even more drunkenly than before. After failing to hit the "dark spots" and "hollows" two or three times as I staggered to the roll, and once even missing the furnace door itself, one of the stokers, taking compassion, relieved me of the scoop and put the trouble right with a half dozen quickly tossed shovelfuls. I was frankly glad to work over to where I could take a "half nelson" round a bar by the starboard bunker, for the way the open mouth of the furnace was suddenly jumping up at me in the lurches was something more than disconcerting, especially after one of my fellow stokers had told me that his scarred forearm was the result of having once been pitched forward against a red-hot door.

It was easy to see that stoking the furnaces of a ship with a 25 to 30 percent roll is no job for a novice. Keeping one's balance without holding on to something was difficult enough all of the time, and there were intervals when it was a sheer impossibility. Yet the inexorable gong rang out its warnings just the same, and when the number of the door to be stoked slipped into place on the dial, the particular stretch of glowing coals commanded by that aperture had to be fed willy-nilly.

With the coal skip doing a dervish dance from one end to the other of the narrow space, and with even lumps of the coal itself indulging in punitive expeditions on their own account, the waiting stoker needed all the quick-wittedness and shifty-footedness of a bull fighter combined with the nicety of balance of a tight-rope walker, to carry on at all. Yet carry on they did, and with only less clocklike regularity than the imperturbable Kilroy itself.

A heavy slam-banging from the opposite end of the boiler room indicated that things were not going quite so smoothly there, and edging cautiously along, I was presently able to get some hint of the cause from the words of a volubly cursing stoker who limped out to tell me that the "blinkin' skip 'as took charge." Rubbing a bruised shin and glowering balefully from a blackened eye which appeared to have been bumped against a boiler, he explained, in language more forceful than elegant, that some impractical theorist had encouraged them to experiment with wheels on the side of the skip, with the idea of making it easier to push about over the coal-cluttered deck. This had proved a very satisfactory "safe-in-harbor" expedient, but the increased mobility which had proved so useful in fair weather had proved its undoing in foul. In the picturesque language of the sea, it had "taken charge," and so effectually that one swift, straight rush to starboard, followed by a "googly" progress back to port, put every man who, either by chance or intent, barred its way more or less hors de combat. When I peeped gingerly around a corner, the sight I saw was vividly suggestive of those good old days of mass-play American football when a burly halfback was bucking the line of his demoralized opponents.

The heavy three-quarters-full skip had slammed down against the port bunkers when the ship had rolled to that side, and in the second or two it hung there before swinging back again, a half dozen men had thrown themselves upon it in an effort to "clip its wings" by removing the wheels. Either the time was too short, or else they had got in each other's way. At any rate, the wheels were still in position to go round when the battleship, sliding down the reverse of the big wave that had thrown it over, tilted its decks back the other way. Straight down the one-in-three incline from the port to the starboard bunkers lolloped the Juggernaut, dashing the protesting anatomies of the stokers to left and right as it went. Spitting blood and oaths indiscriminately, one man clung to it all the way, however, and he also it was who—taking advantage of the tilt—finally rendered it harmless by pushing it over on its side, where it was left wriggling impotently like an overturned turtle.



"Straight down the one-in-three incline from the port to the starboard bunkers lolloped the Juggernaut, dashing the protesting anatomies of the stokers to left and right as it went. Spitting blood and oaths indiscriminately, one man clung to it all the way . . . and finally rendered it harmless by pushing it over on its side."

Meanwhile the Kilroy had been ringing up its numbers in vain, and it took several minutes of fast shoveling by all hands to bring the fires up to where they would have been had the interruption not occurred.

It was about this time that the bridge called on the engine room for an increase of speed, and it was that, with a change of course, which brought the mounting seas crashing over the starboard bow, which brought my visit to the stokeholds to a sudden and unceremonious end. There came a shivering crash, followed by a momentary halt like that which throws one against his neighbor in a jerkily braked tramcar. The great ship staggered groggily for a second or two as a weight of solid water, equal to its own, was launched against it. Then the relentless urge of its spinning screws drove it forward, with the dish of its rigid hull skimming a few thousand tons off the top of the uprearing wave that had assailed it. The most of the mighty cataclysm surged to lee and back into the sea again, but wherever there was an opening—by gunport, ventilator, or unbattened hatch—it poured below in thunderous torrents. Deck by deck, where we had descended so laboriously by tilting ladders, we heard it bounding lower and lower, and then—just how and by where I never exactly understood—the flood was all about us.

"If we ship two or three more like that it'll be getting to the fires," shouted the warrant officer who had taken me over from the senior engineer. "We'll only be in the way here; we'd best get up while we can. I've stood all the watches I care to in flooded stokeholds in the years I was a stoker myself."

Over steel plates that were upending with the wash of the water that had

"'There was a big crash, just like when a big lump of sea hits you, only worse, and all the stokers and me . . . was knocked flat. We were under forced draft, and the fires needing all the coal we could pitch into them.'"

penetrated beneath them, he led me to a little electric lift into which the two of us were just able to crowd and slide the door. "Never thought much of this thing," he said as the car began to ascend after two or three propitiatory prods at the button; "there's too much chance of getting stalled halfway and spending the night like a tinned herring. But even that would be better than getting caught by another waterfall on one of the ladders. Besides, she seems to be going all right anyway."

Half a minute later the little lift came to a creaking standstill, and we squeezed out to a ladder which led up to the main deck. The wash swirled to our knees in an angle of the mess deck, but the warrant officers' mess, to which I was conducted by my guide, was warm and dry. Toasting bread for our tea in the genial glow of the electric heater, he told me yarns of the days when he himself had (to use his own picturesque expression) "stood at the small end of a shovel" before the furnace doors.

He had once been scalded by escaping steam in the hold of an old cruiser off the coast of South America; once imprisoned in the stokehold of a destroyer for 48 hours in a gale in the sub-Arctic, and once he had been "mentioned" for putting out a fire started by a German shell on some nondescript craft on which he found himself at the time the British navy was trying to protect the retreat along the Flemish coast. The latter sounded like a "story," and I threw a "lead" or two to draw it out. This was about all I got.

"The old 'Flighty' got in too close," he said, turning the slice on his toasting fork, "and the Huns opened up on us with bigger stuff than we reckoned they had there. There was a big crash, just like when a big lump of sea hits you, only worse, and all the stokers and me (I was a petty officer

then) was knocked flat. We were under forced draft, and the fires needing all the coal we could pitch onto them. No one was much hurt, and I got them to shoveling again as soon as I could. Then I took a squint up the ventilator down which most of the shock seemed to come. There was a bit of fire getting under way up there, and so I pitched up two or three buckets of water and put it out. Didn't notice till afterward that a small fragment of shell had come down and hit me in the forehead—right here [touching a jagged cut just under the hair]. Captain seemed rather pleased about it, as the men on fire station in that part of the ship had been knocked out, and he appeared to think I had kept the blaze from getting a big headway. 'Nother funny thing . . ." and he went on to tell of a stoker of a trawler who, after having his face slightly scalded by steam, had lain down and gone to sleep with his head pillowed among some of the steward's recent purchases, and of how the cook, foraging in the twilight and starting to pick up what he thought was a lobster, had nearly pulled off one of the unlucky chap's burned ears!

I sought the foc's'le deck for a breath of fresh air after that, and pushed my head out of the after superstructure just as a hulking cinder came winging aft before the snorting northeast gale. It was quite possible (I said to myself as I ducked inside and pulled down my eyelid in an endeavor to deposit the unwelcome fragment on my cheek) that this very cinder was one which I myself had dumped down one of the bunker chutes during our last coaling.

STREET CAR WRECKS WALL AND TEN OTHER CARS

An accident, perhaps without its equal in the annals of city traction companies, occurred recently when a street car, driven by a student motorman, plunged through the wall of a Cincinnati car barn. A huge section of the wall was torn down by the impact, causing the second floor to give way and throwing 10 cars stored on that level into a heap. To the astonishment of those who rushed to the scene, the motorman and conductor on the car that caused the damage, made their way from the débris but little injured. The roof of their car had saved their lives.

¶A bill, designed to foster our export trade, has been introduced in congress which authorizes the adoption of a national trade-mark for American goods, to be employed only by manufacturers who comply with standard regulations.

Left: The Hole Which an Uncontrolled Street Car Made in the Wall of a Cincinnati Car Barn. Right: Part of the 10 Cars That were Thrown into a Heap When the Second Floor Gave Way

TEMPLE OF LIBERTY RAISED IN CITY THOROUGHFARE

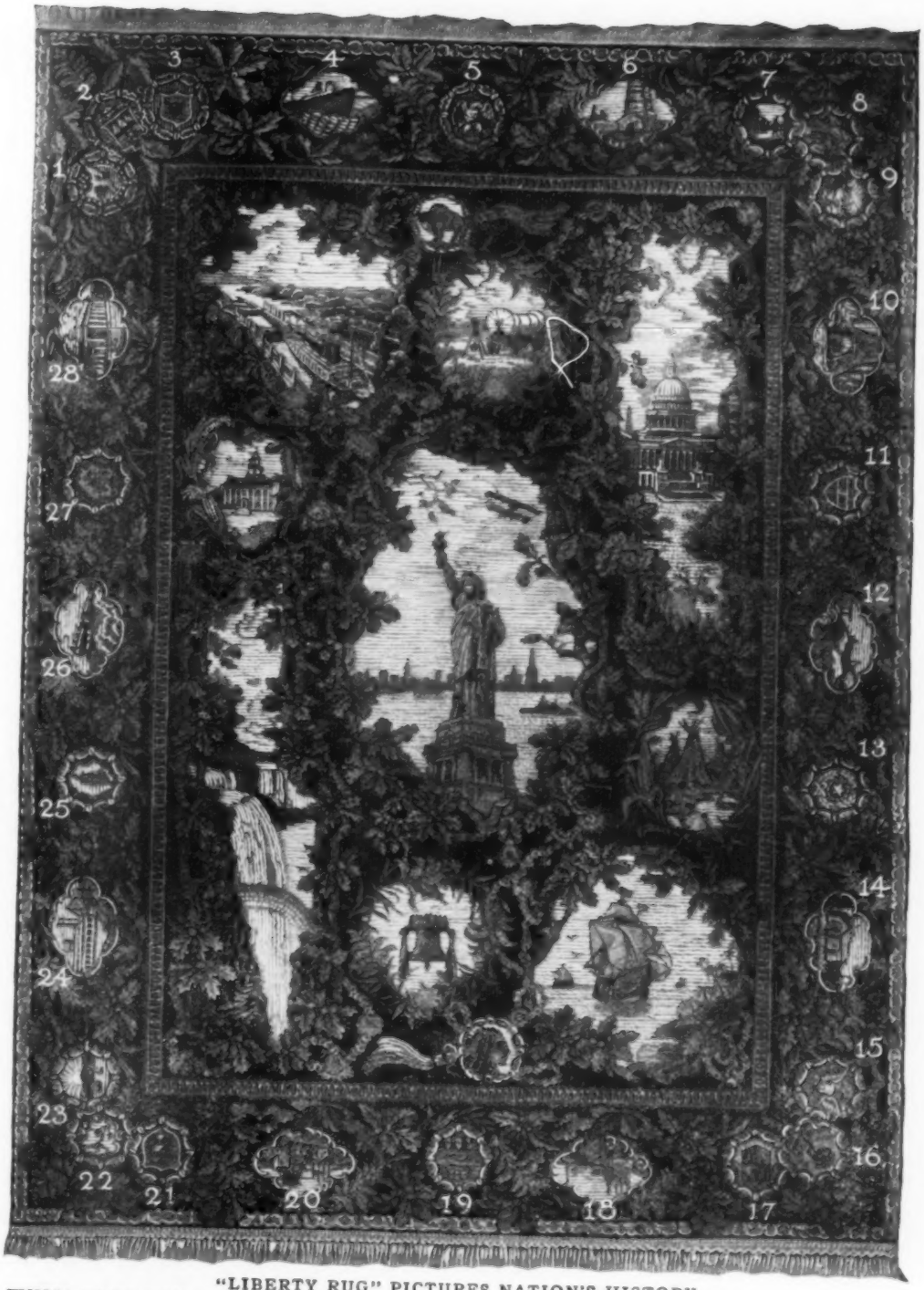
"Liberty Temple," an imposing structure of modified Grecian architecture, stands on the pave ment in one of the principal thor oughfares at the edge of the central business district of Portland, Ore. It gives eloquent expression to the city's war spirit—which is 100-per-cent American—and serves as convenient headquarters for the Liberty Loan committee, and other organizations engaged in patriotic enterprises. The structure was built in a single day without cost to any campaign fund. All of the material and labor involved in its construction was donated. The temple is 28 ft. in height, 40 ft. wide, and 60 ft. long. It contains, in front, a series of offices for campaign managers and their assistants. The remainder of the space is occupied by an assembly room where fair-sized meetings may be held. The roof of the building is arranged as a band stand and is employed as such when there are patriotic gatherings in the street before the temple. Undoubtedly the structure will remain in use throughout the period of the war.

Flags of the Allied Nations Float above the Roof of "Liberty Temple," Which Stands at the Edge of the Central Business Section of Portland, Oregon

TO TRAIN BLIND SOLDIERS FOR GOOD POSITIONS

What is officially declared to be the most complete system of reeducation for blinded soldiers that has ever been undertaken, is to be put into operation by the United States. The country's ablest educators of the blind are coöperating in the work. Men who lose their sight in their country's service will not only be reëducated, but remunerative positions will be found for them. The aim of those in charge of the work is to have the blinded soldiers as efficient industrially as before their injury, and if possible more efficient. There are many cases on record of men who increased their earning power after being trained as blind workers. A private estate of 99 acres near Baltimore, with accommodations for 175 men, has been turned over to the surgeon-general to serve as a complete hospital school for blinded officers and men.

¶ Following the example of leading European countries and the United States, Spain set its clocks ahead one hour April 15.



"LIBERTY RUG" PICTURES NATION'S HISTORY

THIS striking achievement of the weaver's art pictures in colored panels notable phases of our history. Surrounding the Statue of Liberty are Gatun locks in Panama Canal, the national capitol, Columbus' fleet, Niagara Falls, Independence Hall, etc. The numbered designs are: 1, Oregon state seal; 2, Colorado seal; 3, Wisconsin seal; 4, cotton wharf; 5, Illinois seal; 6, oil wells; 7, Michigan seal; 8, Indiana seal; 9, Ohio seal; 10, mammoth trees, California; 11, Arkansas seal; 12, harvesting in Northwest; 13, Texas seal; 14, Lincoln's cabin; 15, Louisiana seal; 16, South Carolina seal; 17, Maryland seal; 18, Pittsburgh steel mills; 19, Pennsylvania seal; 20, coal mines; 21, New Jersey seal; 22, Rhode Island seal; 23, New York seal; 24, Mississippi flatboat; 25, Massachusetts seal; 26, Twentieth Century Limited; 27, Connecticut seal; 28, Mt. Vernon.

BROKEN RAIL BRINGS DEATH TO FIVE UPTON SOLDIERS

Five soldiers were killed and a number of others injured when a broken rail caused the wreck of a troop train bound from Camp Upton to Long Island City some days ago. Eight cars of a 12-car train left the track, four of them sliding down a short embankment and landing on their sides at the edge of the right of way. That there was not a much longer casualty list was due solely to the fact that all of the cars were of steel construction and therefore capable of withstanding the shock. The accident occurred at a point some three miles east of Central Islip, N. Y. The soldiers were members of the 305th Infantry.

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Eight of the 12 Steel Cars Left the Track, Four of Them Sliding down the Embankment and Turning on Their Sides

FRENCH AIR HERO SURVIVES THRILLING ACCIDENTS

Lieutenant Nungesser, to whom the Aero Club of America has awarded its War Medal, and who since the death of Captain Guynemer has headed the list of French airmen with 35 victories, may be said to have a charmed life. He has been absent from the front for some time, owing to a serious wound from which he has now recovered. He has been repeatedly wounded since the beginning of the war, and has been twice condemned as unfit for further service, but every time his robust constitution has risen superior to circumstances.

The list of his injuries is given as follows in a recent issue of Flying: Fracture of the skull; concussion of the brain; five fractures of the upper jaw and two fractures of the lower; shell splinter in the right arm; both knees dislocated; one knee dislocated a second time; piece of a bullet in the mouth; atrophy of the lower tendons of the left leg; atrophy of the calf; two more fractures of the jaw; dislocation of the collar bone; left wrist and right ankle dislocated.

When he was last in hospital the surgeons had not only to treat a fracture of the jaw but a bad contusion of the chest. Nungesser refused to have any anesthetic administered.

He has always returned to the front long before he was officially considered as cured. During one of his periods of convalescence at Dunkirk he brought down nine German machines.

ONLY APPROVED ARTICLES FOR SOLDIERS ABROAD

A recent order of the postmaster-general prohibits the mailing of any articles to our men in Europe other than those for which the soldier addressed has sent a written request, approved by his regimental commander or higher officer. The ruling has been made at the request of the War Department, which has applied the same regulation to express and freight carriers and is undoubtedly prompted by the necessity of conserving carrying space in the limited number of ships available for transatlantic service. The approved written request from the soldier to whom articles are being sent must be inclosed in the parcel, whether sealed or unsealed, and on the outside must be written, "This parcel contains only articles sent at the approved request of the addressee, which is inclosed."

FLEECE-LINED MOCCASINS FOR OUR AIRMEN

The official aviation boot for the American army is a moccasin made very large so that it can be quickly put on over the regular army shoe, and as easily taken off. The lining is of sheepskin wool, half an inch thick, and the leather used is elk hide, finished in oil.

¶A lieutenant in the Argentine army recently crossed the Andes Mountains from Argentina to Curico, Chile, a distance of 115 miles, in an aeroplane.

BUILD TINY ONE-MAN TANKS FOR USE IN FRANCE

"Mosquito" tanks, which essentially are diminutive replicas of the powerful armored land dreadnaughts used with great effect by the British on the western front, represent the latest type of fighting machine that has been developed to harass the Hun. These are one-man devices that mount three guns and are built to amble turtlelike across shell holes and mud. Little is known of them except that the controls are so arranged that a lone driver can pilot one of the craft and keep the rifles talking business too. Being speedy, they would serve a big tank as destroyers serve a cruiser in a naval battle.

Although Small in Size, the One-Man Tank Has a Prodigious Capacity for Negotiating Shell-Pitted Quagmires

SILK RIBBON TAKES PLACE OF WOOL FOR KNITTING

The fashioning of knitted garments from special ribbon, instead of from yarn, is a new departure in knitting that is sure to excite the interest of every person skilled in the handicraft made so popular by the war. The material used is about the width of baby ribbon and has a finish that makes it pliable, while fabric made from it is delightfully soft and light. Sweaters, mufflers, slip-ons, hand bags, etc., are

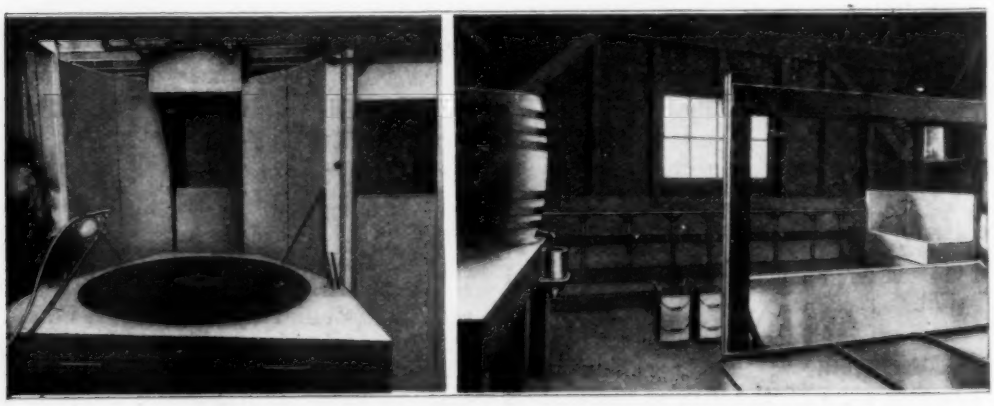
knitted in just the same way as with wool. Many garments made of the all-silk ribbon cost decidedly less than ordinary all-silk garments. Less expensive articles can be made from ribbon that is part cotton. Among the advantages claimed for the new material is that each strand, being woven, has greater strength and durability than yarn. Knitters using this silk material are indirectly saving wool for other purposes, it is pointed out.

The Hat, Bag, and Sweater Shown are Knit from Silk Ribbon. The Insert Pictures the Texture of the New Knitted Fabric in Detail

NEW PAINT SPRAYER HAS VALUABLE FEATURES

Large savings of paint and safer conditions for the operators are among the advantages claimed for a new paint-spraying outfit. In the spraying chamber is a revolving platform on which the articles to be painted are placed. Drippings from them pass down through perforations into pans beneath. Filtered air enters below the platform and is drawn out through a vent or separator at the opposite end, thereby keeping the fumes away from the workers and throwing the spray-laden air against a set of baffles. A splasher throws a nondrying oil against these baffles, washing the pigment down into a receptacle, whence it is drawn off to be used again. Drafts of air keep the light bulbs overhead free from paint.

An automatic chemical sprinkler is located above the platform, and a glass canopy, that deflects overhead air currents, is hung so that too great heat will release one end, letting it swing down and close the vent in case of fire. Paint is supplied to the air brushes from special cans installed in a chamber above. Inside of each is a motor-driven agitator, a strainer, and a strainer cleaner. These cans may be turned upside down when not in use, thus keeping the apparatus in condition to be used quickly.



Left: Spraying Booth of Patented Painting Outfit; over the Revolving Platform Is an Automatic Chemical Sprinkler. Right: The Material Chamber above the Booth, Containing a Barrel and Two Reversible Cans of Paint, Each Connected with an Agitator

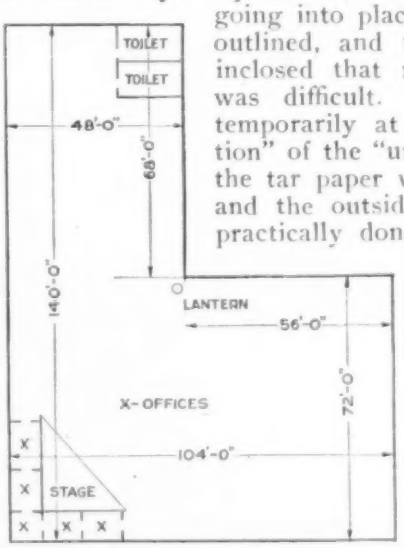
WAR-ACTIVITIES BUILDING ERECTED IN ONE DAY

By Fred Telford

At Nine o'Clock, after Two Hours of Work: The Roofing Gang Busy Nailing Down Sheathing at One End of the Structure, Another Group of Workmen Putting on the Siding. Much of the Studding Is Up

THOUGH many devices have been adopted by resourceful Americans to make things unpleasant for the kaiser, Hammond, Ind., had a plan all its own. This was the erection, in a single day, of a large Liberty Hall, with more than 10,000 sq. ft. of floor space, for war purposes exclusively. Every man on the job contributed his labor.

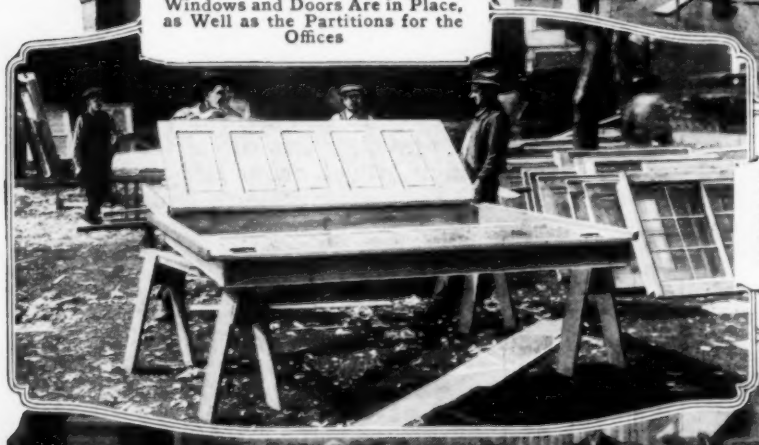
The new Liberty Hall, with an extreme length of 140 ft. and a width of 104 ft., went up with the precision of the most carefully planned army maneuvers. Work began according to schedule at 7 a. m. sharp, but during the rest of the day the schedule was discarded — because it was too slow. At noon the building was more than an hour ahead of time, and by four in the afternoon a good two hours had been gained. So well was the work done that at night the young people held a dance in a building where, 12 hours before, the ground had been bare. At eight, one hour after the work was begun, the foundations were in place, the studding was going up, the flooring gangs were beginning their work, and at one corner the rafters were in place. At ten, the flooring was complete, the sheathing nearly all on, and the siding half up. By eleven, windows and doors were going into place, partitions were well outlined, and the interior so nearly inclosed that making a good photo was difficult. When work stopped temporarily at noon for the "initiation" of the "unit of lady carpenters," the tar paper was going on the roof, and the outside carpenter work was practically done except for odds and ends like the cupola; all the doors and windows were in place and opened for ventilation and ingress or egress.



Showing the Floor Plan and Dimensions of the L-Shaped Building, and the Location of Its Offices and Stage

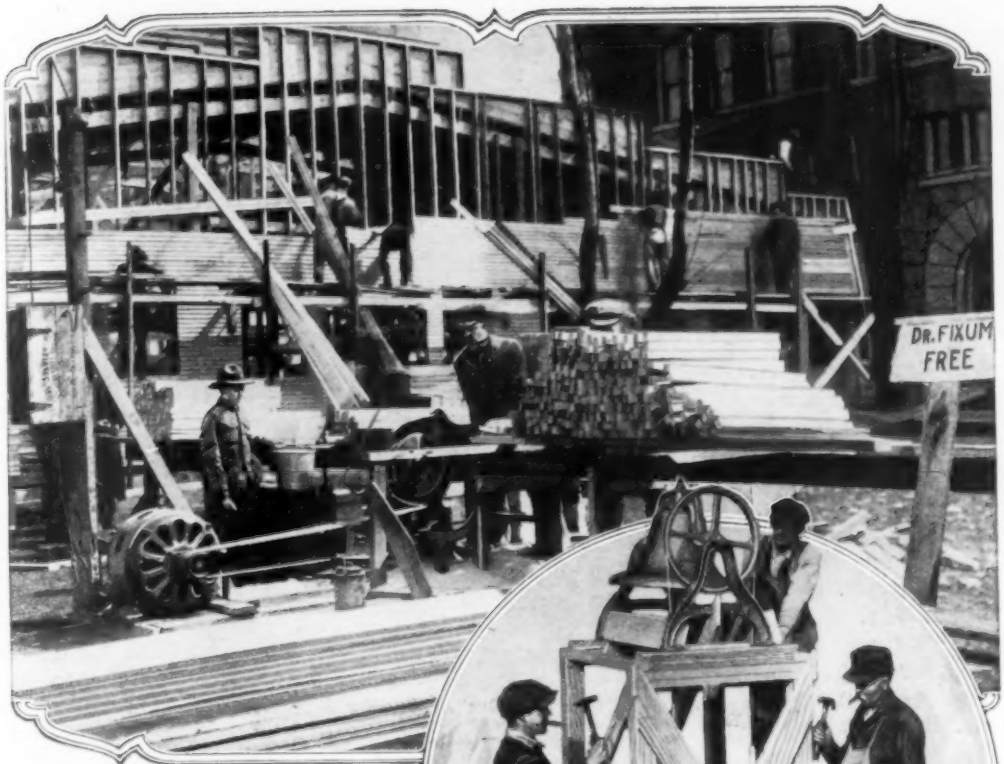
At one, the painters, wiremen, and roofers reported. Shortly before three, the painters had completed their work, while the roofers got through at 3:30 p. m. (except for a few difficult odds and ends), while the wiremen completed wiring the building about four. In the meantime the carpenters were

Interior View of Liberty Hall at 11 o'Clock, the Result of Four Hours' Work: In the Background Windows and Doors Are in Place, as Well as the Partitions for the Offices

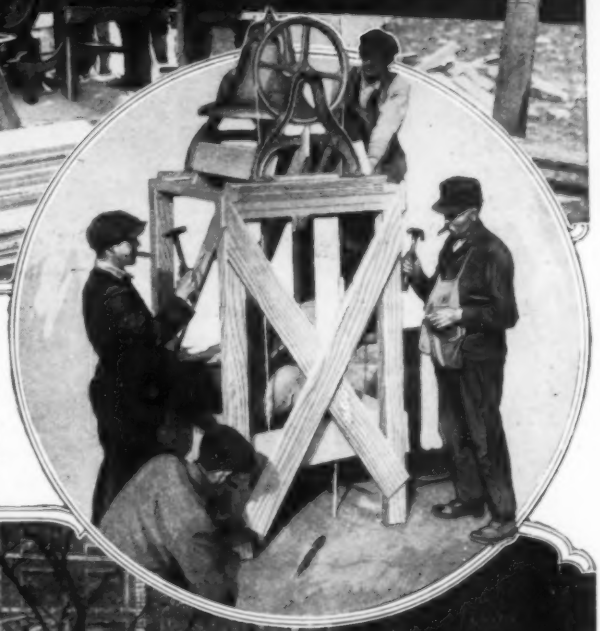


Doors were Hung and Windows Fitted Before Their Casings Were in Place. By Doing This in the Yard, as Here Shown, Much Time was Saved

Everyone Took a Hand in the Work Except the Members of the Usual Gang of Lookers-On, Who Spent Much of Their Time Watching the Group of Women Carpenters Saw Wood. The Latter, However, Were Too Busy to Notice the Attention They Attracted



The Motor-Driven Circular Saw Hummed Busily All Day Long. Among Other Things, It Cut the Material Used in Constructing the 1,800 Seats for the Auditorium



There couldn't Very Well Be a Liberty Hall without a Liberty Bell; Therefore One was Provided to Ring the News When the Building was Finished and Ready for Use

Putting On the Finishing Touches at 3:30 in the Afternoon: In the Background the Liberty Bell is being Installed, and in the Foreground Roofers are Making a Water-Tight Patch around a Tree. Inside, Half of the Seats Are in Place, and Partitions Nearly Finished

completing the partitions and making and installing the 1,800 seats in the auditorium. Before five, the liberty bell had been put in place, the permanent signs put up, the roof completed, and the interior work so nearly finished that the work of "clearing up" was in progress. At seven the dance was on.

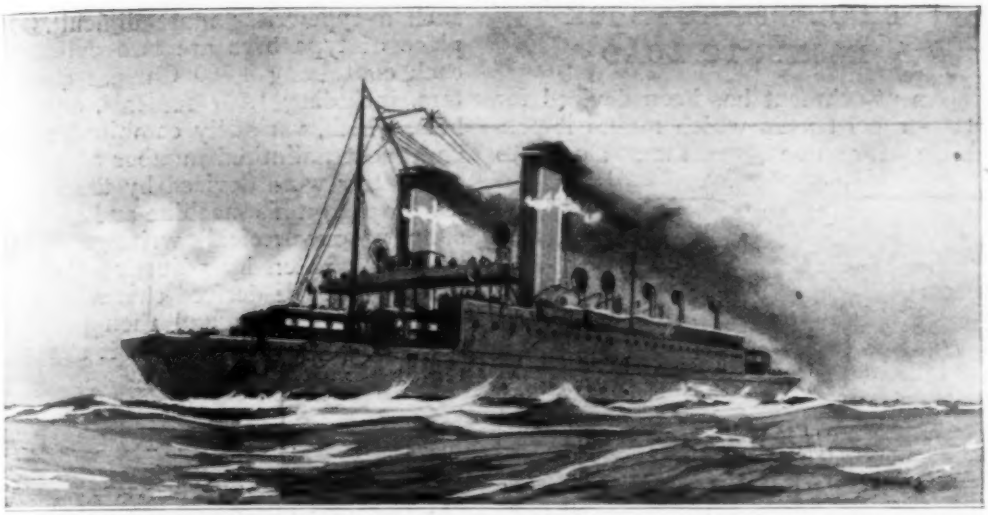
At no time during the day, thanks to careful planning, was there the slightest confusion or delay. Promptly at 9:30 a. m. the men laid off for sandwiches and coffee, while at noon 150 went to a near-by church where a caterer served a substantial meal of three courses; at 12:45 the remaining 75 workmen, the lady carpenters, the musicians, the boy-scout water carriers, and others, were similarly served.

Canning the Sound: An Alert Business Man Brought Over His Dictating Machine and Made Several Records of the Noise of the Scores of Hammers at Work

That the plan went through according to schedule, or more accurately ahead of schedule, was due to careful planning. The 225 workmen were organized into 25 gangs of nine men each—six skilled workmen and three laborers. The foreman of each gang was carefully instructed by the "ground" or "building" boss, and the gang set at a definite task. If any part of the work lagged, as happened occasionally, individuals or a whole gang were shifted to help out.

Only thorough organization in the "work yard" made the rapid work of construction possible. The windows and doors were put into the frames, and all the fine work of fitting, planing, and the like, done in the yard by gangs assigned to this work; then each was carried bodily to its place and nailed in position in a few minutes. Even the big double doors were handled in this manner. Every pile of lumber was labeled so that the laborers knew just what it was for, where to take it, and when to begin. A portable electric cutter was busy all morning cutting the lumber into proper lengths and sawing up the parts from which the seats were made. The seats, in 10 and 12-ft. sections, were nailed together in the yard.

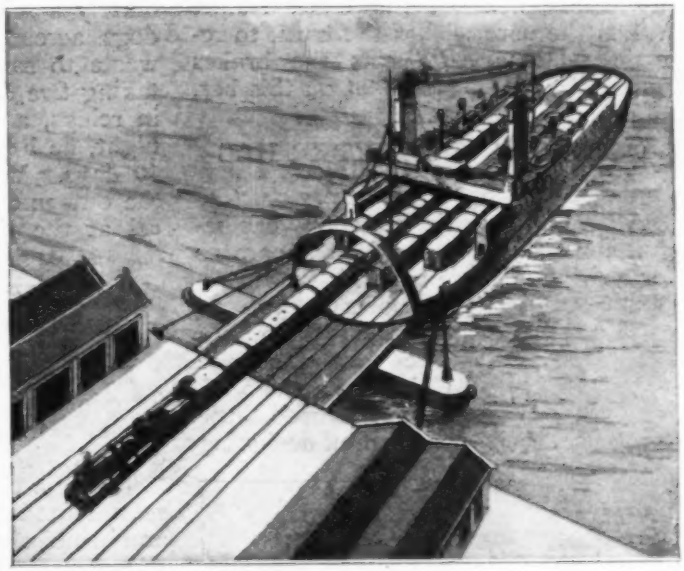
The building will be used for war purposes only. It contains offices for the Red Cross, for the Liberty Loan sales forces, for the American Alliance, and for other war-time organizations. The big auditorium, seating 1,800 and capable of holding 3,000, is intended for holding patriotic meetings of all kinds. The building was dedicated at a big meeting Liberty Day, April 6, just one week after its construction, while on April 13, the women had a rousing rally, with a parade of 4,000 women, and addresses in the auditorium by nationally known speakers. The large foreign element in Hammond will be gathered, instructed in war duties and obligations, and otherwise lined up and held in line to carry on the war vigorously. Practically every person in Hammond had some part in the construction of the building. With a population of only 30,000 to 40,000, Hammond has already furnished 1,700 men for the army and navy, and quite properly considers it incumbent to back them up in every possible manner. The Liberty Hall, built in one day for war purposes, is part of a carefully considered plan to smoke out every disloyalist and to give those at home a chance to serve effectively.



Train Ferry of About 50 Cars' Capacity Which has Greatly Lessened the Handling Involved in Shipping Munitions and Supplies from England across the Channel to the British Forces on French Soil

FIRST TRAIN FERRY TO CROSS ENGLISH CHANNEL

For the first time in the history of railroading a train ferry has crossed the English Channel from Newhaven, England, to Dieppe, France, carrying about 50 cars. Since early in the war thousands of British railway cars have been employed in France in transporting troops and supplies, but they have all been transferred to the continent by freighters. The inauguration of ferry service indicates that the difficulties created by very pronounced tides have been overcome at last to the mutual advantage of these two allies. Train ferries are common between Sweden and Germany, Sweden and Denmark, Italy and Sicily, etc., but their operation is made easy by the absence of tides. At Dieppe the water level varies as much as 31 ft. To overcome this, short bridges, attached at one end to the dock and resting on large floats, are employed. During loading and unloading the ferry is chained to the float and dock pier as well. The two smokestacks are located one at either side of the craft, leaving space for tracks down the center of the deck.



PHOTOS BY COURTESY OF L'ILLUSTRATION

Four-Track Train Ferry, the First to Cross the English Channel: The Bridge, One End of Which Rests on a Float, Provides a Continuous Track from the Ship to the Dock, Regardless of High or Low Tide

BRAKES MAKE TRUCK EASIER TO LOAD

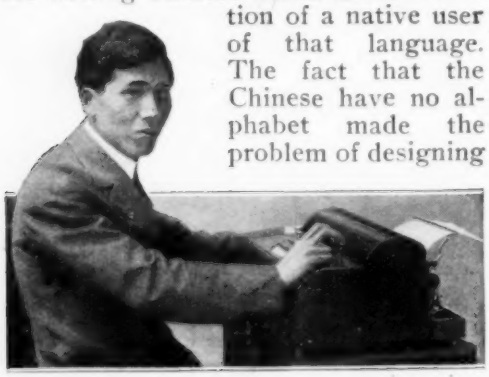
An attachment has been devised for two-wheel trucks which makes it possible for one man alone to

Truck Equipped with Brakes for Both Wheels: The Brakes are Set by Pressing the Foot on the Connecting Bar

load a heavy article on the carrier, whereas two men are required ordinarily. It consists of a spring-held strap brake for each wheel, connected by a bar beneath the truck frame. When the user wishes the truck to remain stationary he sets the brakes merely by placing his foot on this bar.

CHINESE TYPEWRITER HAS THOUSANDS OF SYMBOLS

A large typewriting company has begun the manufacture of an apparatus for writing Chinese which is the invention of a native user of that language. The fact that the Chinese have no alphabet made the problem of designing



Operating a New Chinese Typewriter, Which in Place of an Alphabet, is Provided with 4,200 Characters

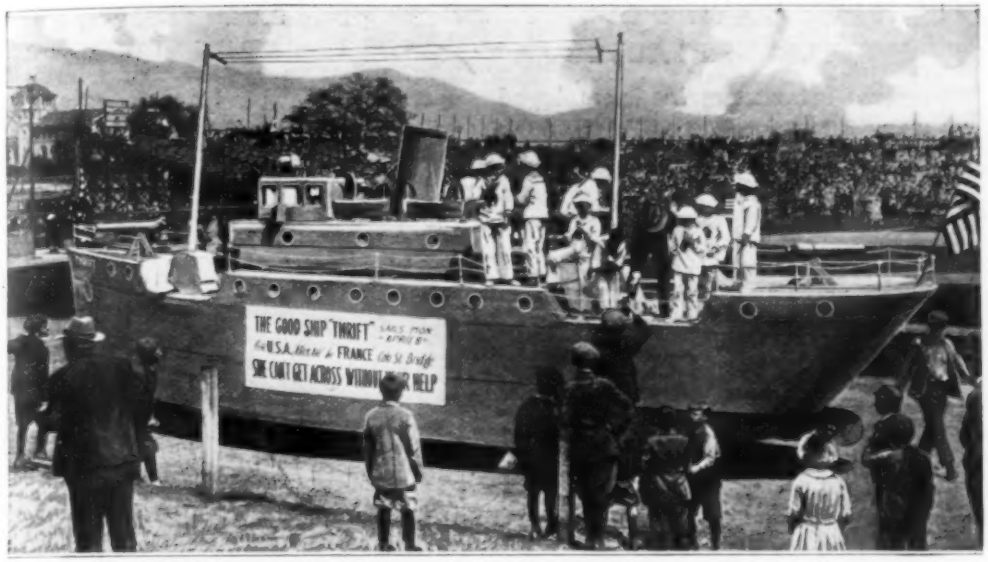
such a typewriter most difficult. In place of type bars are two cylinders, each containing 4,200 Chinese characters, including 1,327 radicals, or symbols, which, variously combined, make an almost unlimited number of words. The latter were devised by the inventor for use on his machine and serve to simplify mechanical writing. Each word is written by adjusting the cylinders until the desired character is in a writing position and then pressing the single key which causes it to register on paper.

HEROIC EFFORT TO SAVE LIFE OF EXPLORER

A story of heroic effort to save the life of the famous arctic explorer, Vilhjalmur Stefansson, has come down from the far North. For many months the Stefansson party has been in winter quarters on Herschel Island, in the Arctic Ocean, north of Yukon. A few weeks ago word came to Fort Yukon, Alaska, that the explorer was critically ill with typhoid. Immediately a mission doctor set out with dogs across the 300 miles of frozen waste to save the stricken man. By taking five dog teams and using them in relays, and by "mushing" day and night, he hoped to reach the island in 10 days. When the world will learn the outcome of the trip is problematical at the time of writing.

WARSHIP "THRIFT" INDEXES CAMPAIGN'S PROGRESS

Effective new features were recently introduced into a campaign in a western city to enroll members in a local war-savings society. The ship "Thrift," a clever model of a war vessel mounted on a truck, was "launched" at a principal street intersection labeled "America," and as members were obtained it was advanced toward its goal, labeled "France." The rate of progress was calculated to bring the "Thrift" to its destination when 20,000 members were obtained. Mem-

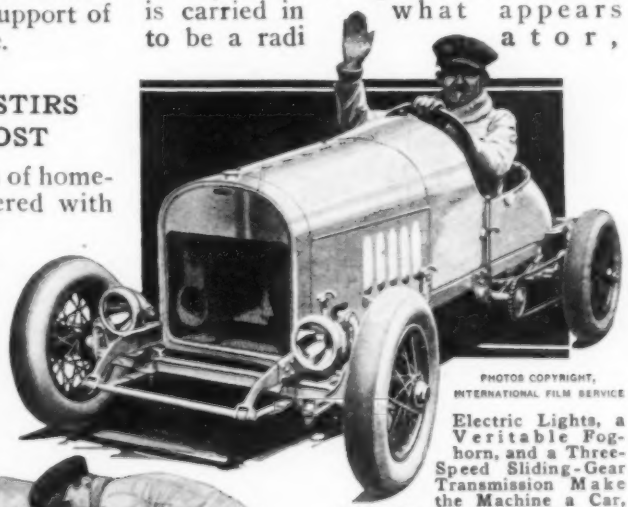


The Land-Going Warship "Thrift" That was Sent from "America" to "France" by 20,000 Patriots: The Vessel was Used in a Novel Way to Enlist Active Support of War Activities

bership, while involving no stated financial obligation, implied support of every war activity, if possible.

"VEST-POCKET CAR" STIRS UP DUST AT LOW COST

Among the classic examples of home-made baby motor cars powered with motorcycle engines, is one recently constructed by a Chicagoan who acquits himself well in the dual rôle of designer and mechanic. His machine, carried on small wire wheels fitted with aeroplane tires, is of the racing type and equipped with a two-cylinder, 11-hp. motor. The oil is carried in what appears to be a radiator, while the fuel tank is concealed within the turtleback extending abaft the single seat.



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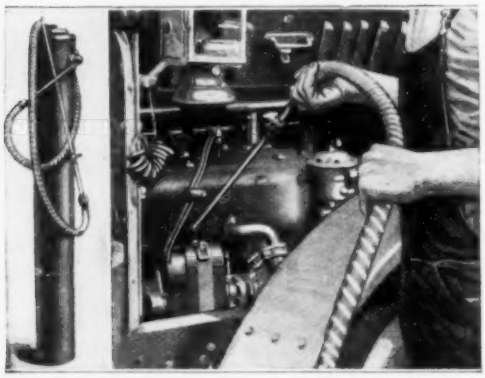
Electric Lights, a Veritable Foghorn, and a Three-Speed Sliding-Gear Transmission Make the Machine a Car, Even Though Its Size Keeps It in the Baby Class

The Car is Not Intended to be Carried Home on One's Back, but a Husky Man could Drag It along without Much Difficulty

The car weighs only 400 lb., has a three-speed sliding-gear transmission, and, motorcyclelike, is noteworthy for its low consumption of gasoline.

CLEVER SPRAYING OUTFIT FOR CLEANING AUTOS

Pressure in water mains is employed in an unusual way by a city water department in cleaning grease and dirt from the engines of cars used by employes. Gasoline, discharged in a spray from a 6-in. cylinder, is the cleaning fluid used. The lower end of the cylinder is connected with a water pipe, and when a valve in the latter is opened, the water forces the gasoline out through the nozzle. When the cylinder has been emptied of gasoline the water is shut off and a second valve, in a discharge pipe, is opened to allow the water and residue of oil to run out.



Cylinder Filled with Gasoline for Cleaning Automobile Engines, Which is Kept under Pressure by being Connected with the City Water Mains

HIGH TIDES WORK HAVOC ON STATEN ISLAND

High tides and an exceptionally stormy sea recently worked such havoc along South Beach, Staten Island, N. Y., that it took on the aspect of a bombarded village in the war zone. Piers were uprooted and fragments of boards and timbers were strewn about in utter confusion, up to the very doors of the frame structures lining the beach, which themselves narrowly escaped destruction.

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South Beach, Staten Island, New York, Suffers from a Sea "Attack": High Tides and Terrific Waves Uprooted and Crushed Piers and Shelters All along the Beach. The Frame Structures at the Right Narrowly Escaped Destruction

NEWARK LIBRARY DISPLAYS MODEL OF CAMP DIX

QUITE a large and elaborate model of Camp Dix, at Wrightstown, N. J., where more than 40,000 national army men of that state, Delaware, and parts of New York are training, has been displayed at the Newark public library. It is 12 ft. long, 8 ft. wide, and made to scale. The model represents a field that is about two miles in length, nearly two miles wide, and dotted with some 1,200 buildings.

ENORMOUS BASE IN FRANCE TO DO OUR REPAIR WORK

Every means possible is being employed to simplify the construction of the mammoth ordnance base depot which our government is now building in France. The group of structures will cover about 100 acres, and to build them will require 18,000 tons of structural steel, all of which must be shipped from the United States. For the most part the structural-steel members will be of uniform size and interchangeable, and bolted instead of riveted connections will be used. In the plant will be facilities for boring out and relining the biggest field and siege guns, and howitzers, and also for repairing rifles, bayonets, machine guns, pistols, canteens, haversacks, etc. One department of the plant will be used in overhauling tractors, tanks, and motor trucks. Living accommodations will also have to be provided for the thousands of workers.

LIBERTY CYCLE'S WHEELS INTERCHANGEABLE

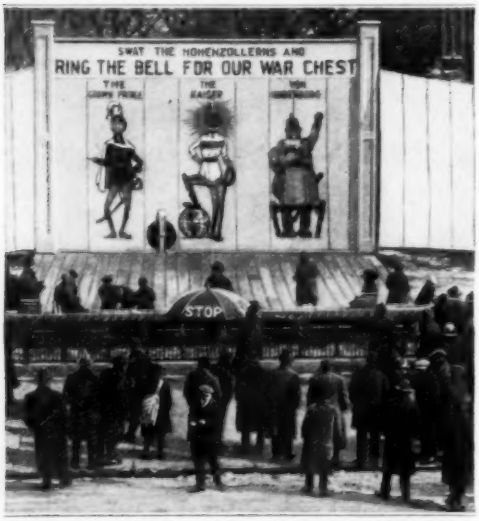
One of the outstanding features of the Liberty motorcycle, the standardized machine developed by the Quartermaster Corps for army service in France, is the interchangeability of its wheels. A spare wheel, to be carried on the sidecar, will take the place of any one of the three wheels in case of an emergency. Furthermore, such a change can be made in less than a minute. The hub construction is a radical departure from standard practice. On

After Removing the Center Bolt the Wheel is Withdrawn from the Rear Fork without Disturbing the Driving or Brake Mechanisms

either side are transverse tongues which fit into grooves in the driving-sprocket and brake-drum mechanisms carried on opposite prongs of the rear fork. In mounting the wheel it is only necessary to slide it into place and lock it with a knock-out axle, which consists simply of a central bolt and nut. To enable the withdrawal of the wheel from the rear fork in the manner described, the fender is hinged so that it may be raised out of the way.

"KAISER BOARD" WINS GIFTS FOR WAR WORK

A "kaiser board," at which patrons on paying a small fee were allowed to



So Many Patriots Were Eager to Pay for the Privilege of "Swatting" These Caricatures of Enemy Leaders That in Three Days the Board was Battered to Pieces

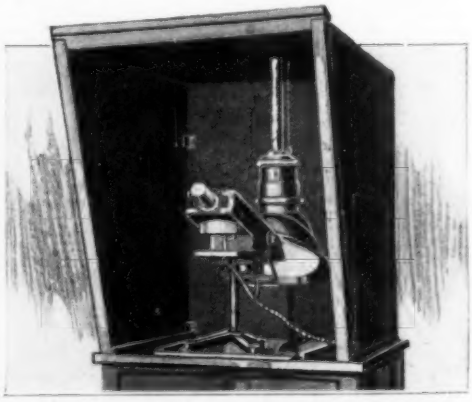
throw, was one device employed in Columbus, Ohio, recently to help raise $3,000,000 for war work. Caricatures of the kaiser, crown prince, and von Hindenburg were painted on the board, the faces being painted on flaps hung in oval openings. When these were hit they caused an electric gong to ring.

SMALL LOSS IN CONVERTING ELECTRICITY INTO STEAM

High efficiency is claimed for a new type of electric steam generator that has been developed by a colonel of engineers in the Italian army. The resistance of the water to be vaporized is employed in the direct conversion of electricity into heat. The apparatus is designed to be connected to the pipes of an ordinary boiler so that at any time temporary use may be made of available hydroelectric energy. It is built to operate at a pressure of about 200 lb. The volume of steam produced varies in accordance with the area of the immersed electrodes. The system is an entirely automatic one that demands no personal regulation and is reported to have shown an efficiency approximating 98 per cent. Each of the eight generators of one battery fed by a three-phase, 6,000-volt current is reported to develop from 1,980 to 2,200 lb. of steam an hour.

COLOR METER GIVES VALUES IN NUMERICAL TERMS

For accurately determining color values and comparing different shades and hues in order to classify them, a new instrument has been developed which is particularly adapted for testing paper pulps, oils, and other liquids, and various products such as soaps and pastes. The human element is practically eliminated, and color values are shown in numerical terms. To assure uniformity, a special lamp is used as a light source. Its rays strike two blocks of magnesium carbonate—on one of which the test sample is placed—and are reflected through a pair of adjustable slits into the instrument. They then pass through a revolving mixing wheel composed of several lenses. This member spreads the light over the two halves of the matching field, which are separated by a vertical hair line and visible through a telescope. The measuring is done



With This Meter Even a Color-Blind Operator can Determine Color Values with Accuracy and Compare Different Shades and Hues

with three screens which color both of the fields. Owing to the effect of the

sample, one of the fields appears darker than the other. By manipulating a lever over a scale and thus adjusting the slit through which the light from the unobstructed magnesium block is reflected, the fields are brought to the same color depth, and when they have been matched in this way, the numerical value may be read on the scale.

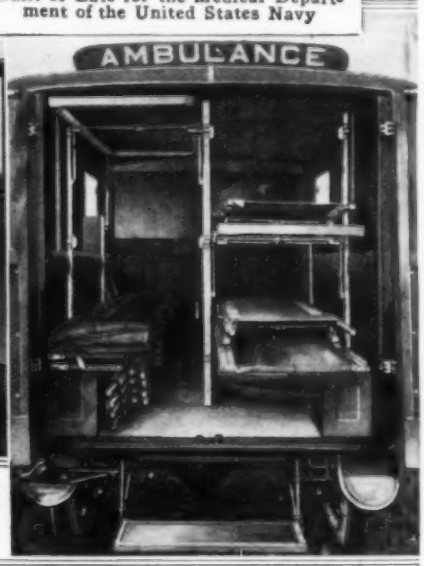
LINES OF WHITE POSTS AID WOUNDED SOLDIERS

Lines of heavy wooden posts, painted white to render them conspicuous, are placed across No Man's Land and through communication trenches of the allied battle front to aid wounded soldiers in getting to the dressing stations back of their lines. The posts are set by members of the engineer corps at distances which enable a man who is wounded but able to walk to swing himself along from one post to the next. By this means thousands of wounded soldiers have made their way to safety without being compelled to wait for assistance.

GOOD DESIGNING IS SEEN IN NAVY AMBULANCE

Quick, easy loading is one of the important features of a fine-appearing ambulance lately built for the medical department of the navy. Twelve sitting patients, or four stretcher cases, can be accommodated. The interior arrangement is such that one folding wall seat and two stretchers may be used simultaneously, if it should be found desirable to do so. Employed in this manner the facilities are adequate to seat six persons and allow two stretcher patients to be transported in an easy recumbent position at the same time.

New Ambulance, Embodying Good Ideas in Designing, That has been Built of Late for the Medical Department of the United States Navy



The Interior Views of the Ambulance Given Above and at the Side Show Two of the Three Ways in Which Its Carrying Facilities may be Employed. Two Men Have No Difficulty in Placing an Occupied Stretcher in Position

COMMUTATOR IS RESURFACED WITHOUT LATHE WORK

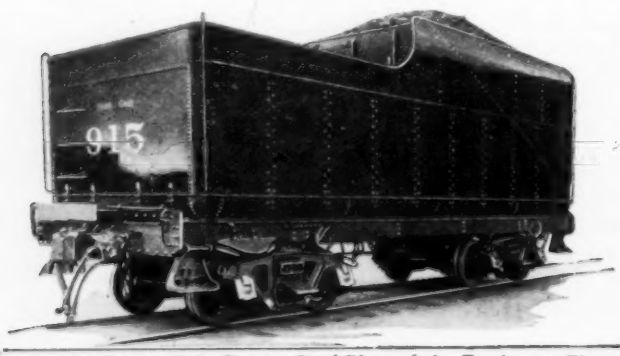
Of late a commutator resurfacer has been brought out that eliminates lathe work. It is made of a nonmetallic abrasive material that is claimed not to collect copper dust or wear smooth. Therefore it may be used when a machine is in operation without, it is said, danger of causing a short circuit. The device is supplied with a permanent handle that enables an operator to control it readily while cutting down high mica and bars and smoothing low spots, ridges, and grooves.

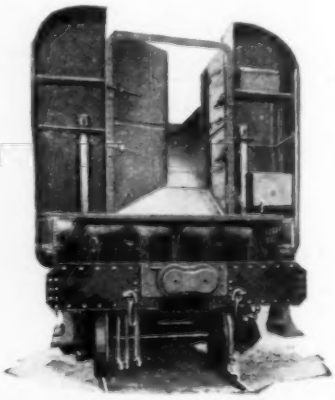
PRINTING LIBERTY BONDS A BIG TASK

While approximately 6,000,000 bonds were printed for the first Liberty loan and 17,000,000 for the second, 21,100,000 were required for the third. This was so big a task that greatly increased facilities were needed by the Bureau of Printing and Engraving. At the outset 15 huge presses, running night and day six days a week, were used. Later this number was increased to 58. About 400 persons were employed for several months in producing the bonds for the third issue. To speed up the output a system was installed whereby six bonds were printed for each four produced formerly, and whereas four printings had been necessary for what is called surface work, a plant was installed which did the work in two printings. In the work done by the skilled bank-note engravers, the bureau had difficulty in adding to its output materially, for it is said that there are probably not more than 100 men in the world trained in this work.

LOCOMOTIVE TENDER HAS COMFORT FEATURES

Comfort and economy are served in a new type of locomotive tender that has been built for the Rock Island lines. In the front end of the tank are convenient recesses where the crew's clothes boxes may be placed. Drinking water is provided in a steel tank having separate compartments for ice and water, as required by various state laws. The bottom sheet of the body, instead of being joined to the side sheets by angle irons, has the edges flanged upward on all four sides, a strength-giving arrangement that requires one row of rivets less for the entire distance around the tank. At the corners are rounded castings, inserted to avoid a difficult job of flanging, and to make leaks less probable at those points.





Left: The Edges of the Bottom Steel Plate of the Tender are Flanged Upward, Eliminating One Row of Rivets. Right: Front End of Tender with Recesses for Crew's Boxes and Drinking-Water Tank

OUR ENGINEERS REMAKE A FRENCH HARBOR

One of the biggest achievements of our engineering army in this war has been the transformation of the port of entry in France for our expeditionary forces from an insignificant shipping point to a harbor in which 60 steamers can take on and unload cargoes at once. Today this military distributing center rivals the greatest port in this country. A deep channel had to be dredged in place of the shallow one that existed before, and the marshes adjoining had to be filled so that miles of switch track could be laid and numberless warehouses built. Shops and round houses had to be provided to keep our extensive rolling stock in repair and provision made for the hundreds of train crews that handle the army supplies. The making of all these improvements in so short a time required the services of many battalions of engineers whose ranks included men of technical training, representing as many branches as are to be found in any industrial organization.

TANK DOES DESTRUCTIVE WORK IN BOSTON

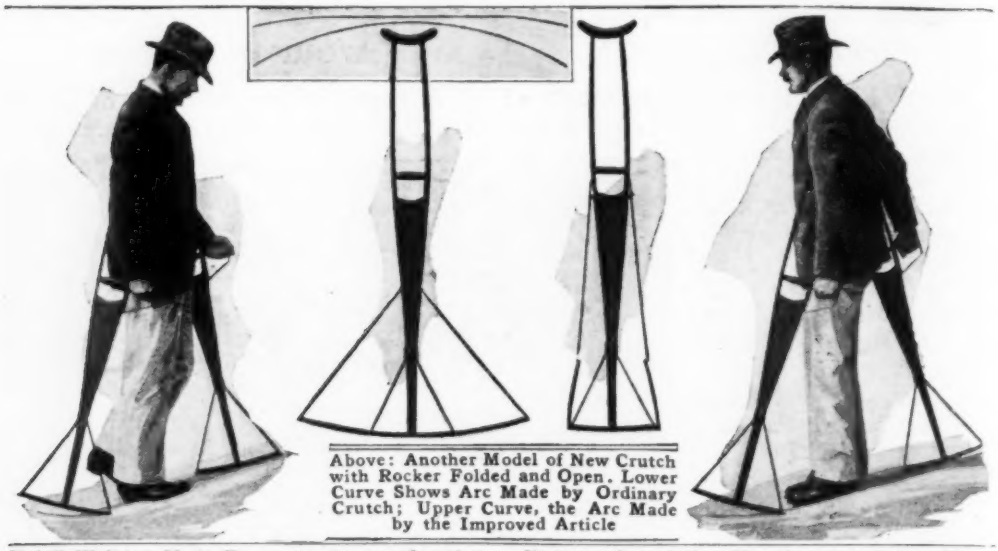
A spectacular exhibition of its destructive power was given recently by a genuine British tank on display in Boston. Not long ago a contractor, engaged in wrecking a large building, decided that this modern engine of war could render effective assistance. Accordingly portions of the heavy brick walls were left standing for the iron monster to attack, which it did with astonishing ease, the barriers falling before it as if they had been of cardboard.

A Friendly Attack by a British Tank in Boston: The Iron Monster is Demonstrating Its Power by Wrecking the Walls of a Large Building That was being Torn Down

IMPROVED CRUTCHES HAVE ROCKER ENDS

The crutch, which has remained practically unchanged for centuries, has at last been improved upon. A rubber-cushioned rocker, of ¼-in. iron, takes the place of the pointed end so that throughout each step the user's shoulder remains practically the same distance from the ground. The upper end of the ordinary crutch describes an arc with each step, requiring extra effort to raise the user's weight to the top of the curve.

The ends of each rocker are hinged to the central portion and by readjusting the braces attached to them, can be folded up, making a shorter rocker, more suitable for use in crowded districts. Handles projecting from the regular handles on a pair of these crutches also help to make walking easier. When the weight is thrown on them the tendency is for the body to rock forward of itself—an especial convenience when going uphill. When



Above: Another Model of New Crutch with Rocker Folded and Open. Lower Curve Shows Arc Made by Ordinary Crutch; Upper Curve, the Arc Made by the Improved Article

Uphill Walking Made Easy with Rocker Crutches, the Weight being Thrown Forward of Center on the Projecting Handles

Walking Downhill: The Crutches being Turned Around, the Weight on the Handles Tends to Retard the Walker

traveling downhill the position of each crutch is reversed, and the weight on the handles tends to retard the walker.

FETE TWO FAMOUS AIRMEN AFTER ESCAPING HUNS

At a banquet of welcome held at the French Aero Club's Paris quarters early in March, the undersecretary of state for aviation announced that Lieutenant Garros had been made officer, and Lieutenant Marchal, chevalier, of the Legion of Honor. This came as a fitting climax to the news of the two famous airmen's escape from Germany. Lieutenant Garros, the first flier to cross the Mediterranean, has long occupied an enviable position in the aeronautical world. At the outbreak of the war innumerable fantastic stories of remarkable feats executed by him burdened the cables. In 1915, however, while making a flight behind the German lines, he was forced to the ground by engine trouble. Thus, before the war had fairly started, he became a German prisoner. Lieutenant Marchal was captured in 1916 at the end of his marvelous raid on Berlin. After penetrating into Germany for more than 800 miles, he was compelled to make a forced landing instead of escaping into Russia as had been planned.

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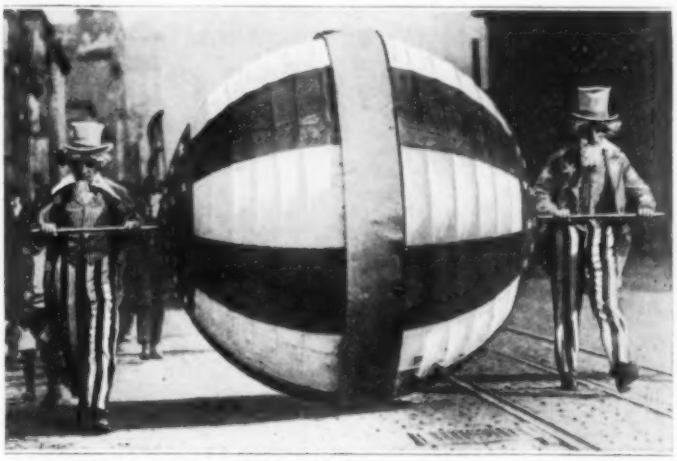
Lieutenant Garros at the Left, and Lieutenant Marchal at the Right of Senator Deutsch de la Meurthe, the Great Patron of Aviation and President of the French Aero Club: Garros is Shown Wearing the Rosette of an Officer, and Marchal the Ribbon of a Chevalier, of the Legion of Honor

¶A school is to be established in France under Y. M. C. A. auspices as a component part of our army, where men will be taught not only subjects relating to fighting but will be prepared for vocational usefulness after the war.

BOND BUYERS ROLL LIBERTY BALL ACROSS STATE

One of the features of the recent Liberty Loan drive was the liberty ball, a seven-foot red, white, and blue sphere that was rolled from Buffalo to New York by two sons of "Uncle Sam" dressed in traditional attire. The ball started on its long trip the first day of the bond campaign and reached Gotham on the closing one. "Keep the ball rolling" was the slogan that helped to sell many bonds.



Escorted by Two of Sam's Sons, the Liberty Ball on Its Rolling Trip of 442 Miles from Buffalo to New York: The Picture Shows the Big Sphere being Pushed along One of the Principal Thoroughfares of Buffalo

EMERGENCY FIELD HOSPITALS BUILT ON MOTOR TRUCKS

Each of a number of portable field-hospital units, recently constructed in the East for service in France, contains a dispensary, operating room, and "ward." Illumination of the interior during the daytime is provided by a skylight built in the central part of the roof. Cases that require instant attention will be received by the surgeons in charge of these units at the front.

NEW ROCKING-CHAIR HAS READING-LAMP CANOPY

A reed rocking-chair, equipped with a canopy and an electric light for reading purposes, is one of the newest

Governor McCall of Massachusetts and His Party during an Inspection of Two of the New Mobile Hospitals: Each of These Units Contains a Dispensary, Operating Room, and "Ward." A Skylight in the Roof Provides for Illumination in the Daytime

pieces of furniture for summer use. The high back of the chair is topped by a circular hood in which is a light bulb connected by a flexible cord with

A New Idea in Reed Furniture: The Lamp Concealed in the Canopy is Well Situated for Reading and Affords Indirect Lighting for the Room

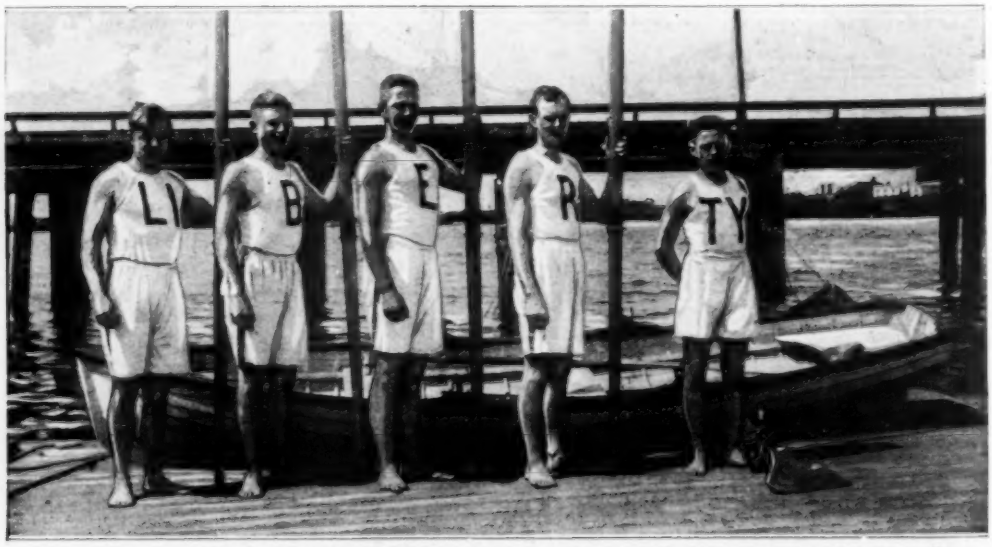
any near-by socket. The light can be turned on and off by means of a switch in one arm. The chair is especially suited for a fireside or a dark corner of a porch.

READ OFFICIAL BULLETIN, WRITE FEWER LETTERS

All persons who contemplate writing letters of inquiry to officials in Washington will perform a patriotic act by first consulting "The Official Bulletin," published by the government, to see if the information they seek is to be found there. The army of clerks in the capital are overwhelmed with work, according to a recent official statement, and their burden is greatly increased by unnecessary inquiries. The bulletin is on file in every post office and in practically every public library, and contains all important rulings, decisions, and regulations.

CREW SHOWS PATRIOTISM IN ITS NAME

When a rowing crew which was preparing to share in a large athletic meet undertook to find a name that was thoroughly distinctive it chose the name "Liberty Crew." The seven letters in the word were sewn onto the five men's jerseys in such order that when each man was in his place they spelled the word "liberty." Needless to say, the clever idea instantly caught the attention of the spectators at the meet.



Rowing Crew That Showed Its Patriotism by Adopting One of the Most Popular Words of the Day for Its Name: The Letters Are in Blue Silk, Matching the Stripes on the Trunks

GIRL'S "LETTERS" HOME ARE PHONOGRAPH CYLINDERS

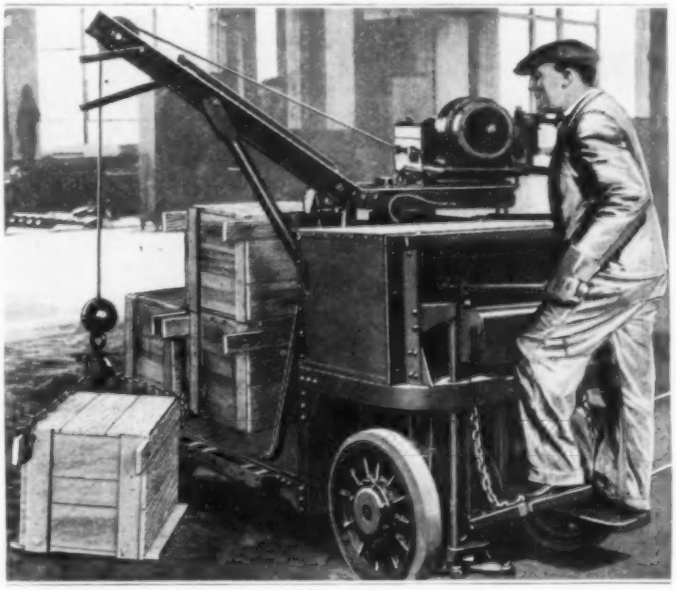
An eastern business man and his daughter, attending a distant college, "correspond" with each other by means of dictating machines, showing that the possibilities of this modern invention are by no means limited to its use in business. The waxlike cylinders are frequently exchanged between the father and the college girl, each bearing a message far more personal and satisfying than a letter. Until this pleasant practice began, the two scarcely realized how much of the personal element is lost in committing thoughts to writing. The records enable each to hear the voice of the other with all the characteristic inflection and with laughter sometimes interjected. "Chats" of a thousand or more words are not uncommon. To mail a light cylinder costs little more than to post a letter, and as each record may be used many times, the expense of keeping up the "correspondence" is low.

METAL-BASE CLAMP ASSISTS MAKER OF AUTO SEATS

Among the new developments of possible interest to upholsterers is a metal-base clamp for motor-car seats. One of the chief advantages of the device is that it saves much time for the trimmer by eliminating the necessity of tacking or stitching the leather, or sewing on a welt for binding purposes. A trimmer has only to draw the material over a flange and lock a clamping strip in place, to complete a seat. Once in place, the device holds firmly.

ELECTRIC TRUCK EQUIPPED WITH SMALL CRANE

For factory and warehouse use, a 4,000-lb. capacity industrial truck with electric-crane equipment has been developed. The lifting mechanism consists of an inclosed reduction and hoist drum connected with a low-voltage reversing motor. The revolving jib crane is of substantial construction and is carried on a ball-bearing pedestal. It has a capacity of 1,000 lb. at its maximum reach, and may be swung to the left or right 28 in. over the side of the platform. The hoisting unit is mounted on, and revolves with, the crane boom. Separate motors, but only one set of batteries, are used for hoisting and propelling purposes.

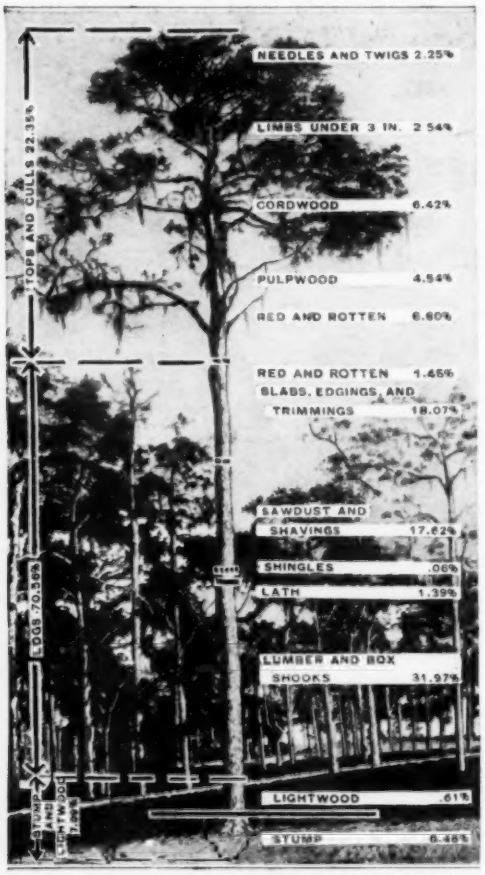


Showing the Crane-Equipped Industrial Truck at Work: The Hoist Unit is Mounted on, and Revolves with, the Crane Boom, Counterbalancing the Load to a Degree

FABULOUS AMOUNT WASTED IN CUTTING OUR TREES

Americans, in addition to being most extravagant in the number of trees they cut, are utterly inefficient in utilizing them after they are felled. Scientists have shown that about two-thirds of the material is thrown away. If in

each case the entire tree were used as it should be, the long-leaf-pine industry alone would produce daily 40,000 tons



COURTESY OF THE LITTLE JOURNAL

The Materials and Parts to Which a Long-Leaf Pine Tree may be Reduced, and Their Percentages, are Shown Above. Some Concerns Are Far More Efficient Than Others in Utilizing a Whole Tree

of paper, 3,000 tons of rosin, 300,000 gal. of turpentine, and 600,000 gal. of ethyl.

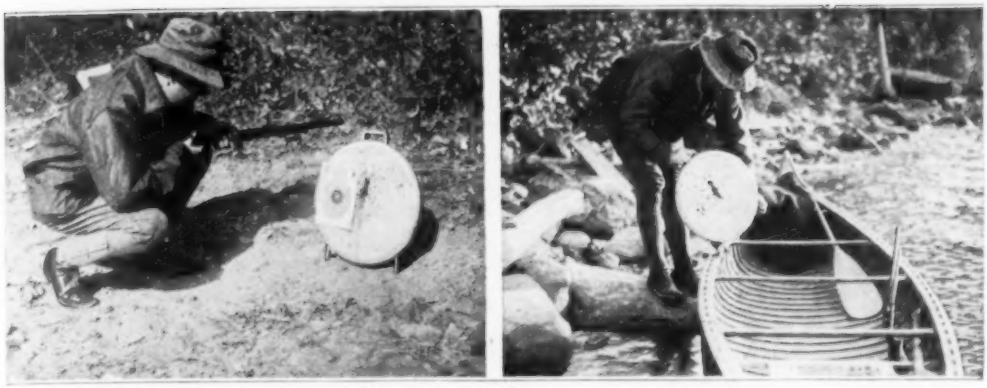
FREE SCHOOLS TRAIN BOYS FOR SIGNAL CORPS WORK

In several of the large cities there are free schools at which young men, awaiting the call for military service, may receive special instruction that will put them in line for rapid advancement when they reach training camp. Since last July members of the Board of Trade at Chicago have financed an institution of this character which devotes its attention to fitting Class A men for service with the Signal Corps. Each day, from nine in the morning until nine at night, classes in radio and buzzer telegraphy, close-order infantry drill, wigwag and semaphore work, map drawing, and heliography are conducted. Only men who are physically and mentally fit and certain of being called for service are enrolled.

During the comparatively short time that the school has been in operation, 900 young fellows have been trained for this prize branch of the service. Boys without previous knowledge of the subjects of instruction have, by spending their spare hours at the institution, subsequently gone to training camp ready for advanced work and speedy promotion. Attendance at the school has given the boys another advantage. Calls are frequently received there for advanced students who wish to avail themselves of good opportunities. For instance, a short time ago 40 young fellows were sent from the Board of Trade school to the Carnegie Institute of Technology, there, with all expenses paid, to receive a special course fitting them for Signal Corps posts paying as high as $81 a month.

Unless one understands telegraphy and wigwagging he is out of the running so far as hope of getting into the Signal Corps is concerned. And this is the service that offers the average boy his greatest opportunity. It places him at the very fountain head of all orders, in an organization of skilled, alert men. For every 127 privates, the Signal Corps has 76 noncommissioned officers—a ratio that does not exist in any other branch of the service.

Obviously the more time a Class A man spends at some such school as this, before going to his training camp, the better it is for him. By attending classes two or three hours daily for six weeks or two months, he is put well along the road. Of especial advantage is the training for the aspiring airman, for a previous knowledge of Signal Corps work more than doubles his chances of passing the stiff examinations he will receive at the ground school.



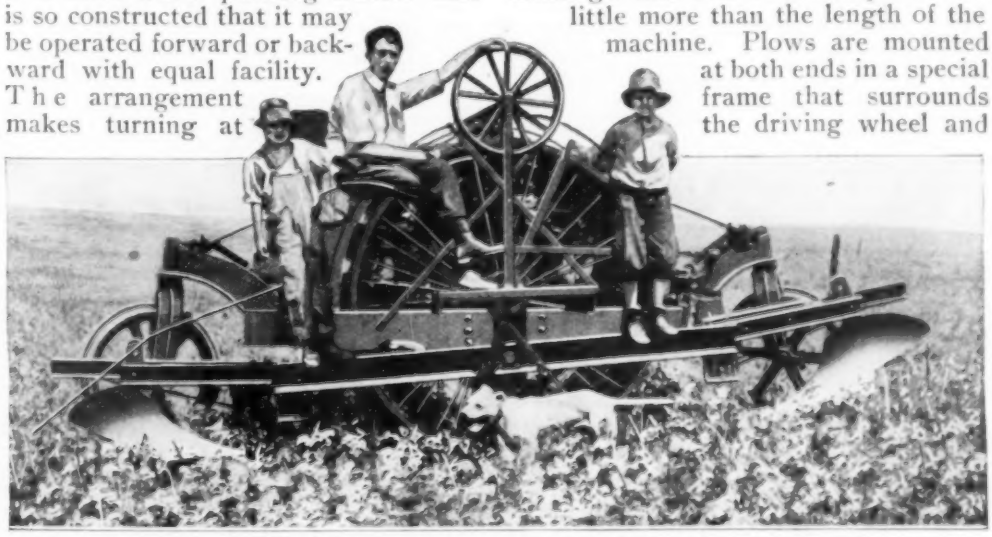
Indoors or Afield, Rifle and Pistol Practice Is a Fascinating Pastime. The Two Views of the Target Presented Here Show It in Use in the Open and Its Portability

PORTABLE TARGET IS MADE FOR INDOOR SHOOTING

Quite an inexpensive substitute for an expensive indoor rifle range has made its appearance in the form of a portable wood-faced steel disk that serves as a backstop on which to tack paper targets. It is 16½ in. in diameter and therefore can be used safely by anyone who has any business whatever handling a rifle or revolver. The bullets and all the spray from them remain inside of the target. When the wooden face becomes badly perforated, it may easily be replaced. The device weighs 30 lb. and is therefore easily carried afield for long-range outdoor shooting. The metal part is supplied at the top with a handle and at the bottom with legs that hold the target in an upright position when it is being used.

REVERSIBLE FARM TRACTOR BUILT ON NOVEL PLAN

Extremely unusual in construction is a three-wheel plowing tractor that is so constructed that it may be operated forward or backward with equal facility. The arrangement makes turning at opposite ends of a field unnecessary, although this can be accomplished in little more than the length of the machine. Plows are mounted at both ends in a special frame that surrounds the driving wheel and



The Plows are Held at Opposite Ends of a Rocking Frame and Follow the Path Smoothed by the Driving Wheel

is pivoted beneath the latter's axle. Either end of this frame may be lowered to bring the plows into working position directly in the smoothed path of the big wheel. The pilot's seat is pivoted so that by swinging it one way or the other he faces in the direction of travel. What appears to be the steering wheel of the tractor is in reality a triple one which controls the guiding wheels, clutch, and gears.

DUPLICATE WORLD'S FAIR STATUE IN BRONZE

A $50,000 bronze duplicate of one of the most prized art treasures of the Chicago World's Fair, the Statue of the Republic, again stands in the park that was once the fair grounds. It has been erected as a memorial of the great exposition and to commemorate Illinois' completion of a century of statehood in 1918. The majestic figure, some 25 feet high, rests on a beautifully carved block of solid granite. The original stood at the head of the principal lagoon in the fair grounds and was gilded.

COURTESY OF THE CHICAGO TRIBUNE

¶ Typewriter ribbons made of the best quality of silk, woven especially for the purpose and saturated in concentrated ink, are said to have proved very satisfactory. Being only .003 in. thick they produce copy that is sharper and clearer than cotton ribbon.

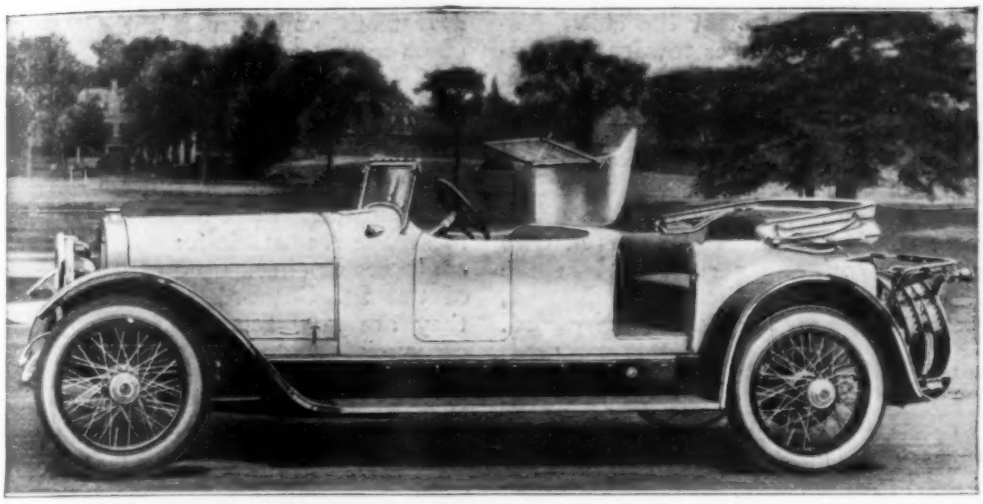
AERIAL MAIL SERVICE SAVES TIME

The aerial mail service between New York, Philadelphia, and Washington, arrangements for which have been completed, will effect an important saving of time in delivering mail not only for the cities named but for many points connected with them by rail. An aeroplane leaving Washington at noon can arrive in New York in time for the afternoon delivery covering the entire city. To do this by train, letters have to be mailed before 9 a. m. The aerial service also makes possible earlier connections at New York for New Haven, Boston, Albany, Syracuse, Buffalo, Cleveland, Toledo, Chicago, and many other points.

Delay was experienced in selecting the landing site in New York because of the high rental asked for suitable property, but a racing association, in a spirit of patriotism, offered its grounds to the government free of charge, and the offer was accepted.

TYPHOON AIDS MOTORBOAT TRADE IN CHINESE PORT

The truth implied in the old saying that it is an ill wind which blows no one good was well illustrated when a typhoon struck Amoy, China, a few months ago. The wind in this case created a big opportunity for motorboat concerns who before had been trying with limited success to substitute modern craft for the four-oar gigs and sampans that ply the harbor in large numbers, carrying foreigners and well-to-do Chinese. Following the destruction of large numbers of native hand-powered boats by the typhoon, a number of individuals have turned to improved craft, among them the Chinese maritime custom officials who have equipped native sampans with four-cylinder, 25-hp. marine motors. An American company has replaced its lost gig by a motor dory. It is hoped that a motor ferry may be established between the two islands bounding the harbor.



Showing the Hinged Center Cowl, with Windshield Attached, Raised to Give Access to the Tonneau. In Normal Position the Screen Gives Rear-Seat Occupants as Much Protection as is Afforded the Chauffeur

TONNEAU WINDSHIELD HELD ON HINGED CENTER COWL

To afford occupants of the tonneau as much protection as the chauffeur derives by virtue of his position in a car, one designer of custom bodies has hit upon a scheme of attaching a windshield to a hinged center cowl. The secondary shield corresponds in height and angularity to the front one, and is mounted at the rear edge of the rather deep extension member, which takes the place of swinging brackets and prevents the downward deflection of air. The arrangement gives a touch of distinctiveness to the appearance of a car. On the other hand, of course, it has the objectionable feature of fitting across the top of the doors, thus forming an obstruction that must be raised to enable one to enter or leave the tonneau.

¶ Desiring to transfer two 60-ton excavators across the Rio Grande below the Elephant Butte dam, where there are no bridges adequate for such loads, it was decided to drive them across the river bed on their own creeper treads. The river was partly drained by closing the dam gates, and then the machines made their way over, despite water and quicksand.

GRANDFATHER CLOCK HAS HIDDEN PHONOGRAPH

A handsome timepiece, 6 ft. 10 in. high, resembling a grandfather clock, in which a phonograph is installed, has been built for use in hotels, large drawing rooms, etc. The motor, tone arm, and turntable are located in a compartment about three feet above the floor, and are accessible through an inconspicuous door in the side. The sound chamber, or horn, is of unusual length and extends inside

Clock Almost Seven Feet Tall Equipped with a Concealed Phonograph, as Indicated

the case to the top of the clock, discharging sound waves toward the ceiling so that they are transmitted with equal clearness in all directions. The lower part of the clock is occupied by eight patented drawers holding 20 records each. The disks stand vertically and, when a drawer is closed, are pressed close together by hinged wire supports on either side. When the drawer is opened these spread apart, permitting easy access to each record.

OLD RUBBER IN DENVER TURNED TO GOOD USE

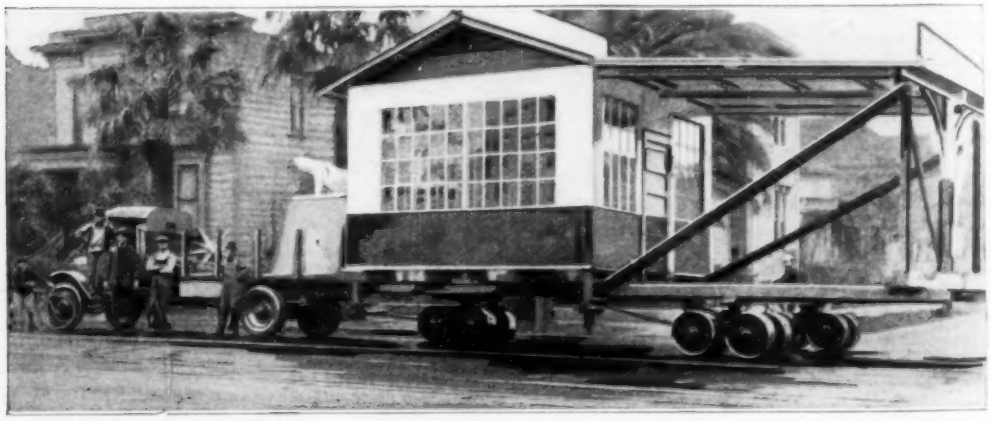
Recently the people of Denver joined in observing "Old Rubber Day" by bringing old rubber articles of every sort, from water bottles to inner tire tubes, and piling them in a great heap on an isle of safety in a down-town street. Between five and six tons of old rubber were contributed in this way and it is expected that a second drive will net even more. A local motor club was in charge of this very practical war-time conservation movement and turned the proceeds, amounting to about $600, over to the Red Cross.

SURVEYORS CHECK LEVELS OF ST. GOTHARD BORE

Diminished traffic on Swiss railways has made it possible for surveyors and engineers to check up on the accuracy of the St. Gothard tunnel levels as they are now recorded. If any discrepancies are found they will have more than local interest, for the survey between the North Sea and the Mediterranean rests on observations taken in Alpine passes, partly made under conditions that make verification desirable. Two groups of men undertook the task in the tunnel, beginning at either end. They worked five nights from 11:30 p. m. until 7:30 a. m., during which time all traffic was carried on one track and the smoke and steam were drawn off at the south end of the bore. The completing of the computations will take a long time, but so far as can be seen at present the discrepancies will be slight.

TRUCK HAULS STRUCTURE TO NEW SITE

The task of moving an automobile-service station to a new site in a western city was accomplished in a surprisingly short time by placing it on



Auto-Service Station and Attached Veranda Roof being Drawn to a New Site by a Truck: The Building Was Unused But Three Days on Account of the Transfer

broad-wheel moving trucks and drawing it to the new location with a motor truck. So well was the building handled that the walls, which were largely of glass, were not injured during the transfer.

SAFETY RAZOR HAS SLIDING SAW-ACTION BLADE

For men with tender skins, the "painless" razor is announced. It has what is described as a saw action. The blade is of the wafer type used in ordinary safety instruments. Instead of remaining stationary, however, it slides back and forth across the beard much as a saw is drawn across a log. This movement is produced by a roller that has small cams at its opposite ends. These bear on upturned levers that impart a sidewise motion to the blade. In as much as a razor edge is toothed somewhat the same as a saw, a side-to-side motion is the logical one to employ in shaving. The new razor takes advantage of this point and is said therefore to be unusually agreeable for tender-skinned persons.

WELL-PLACED BULLET SAVES BIG ELK FROM DEATH

Shooting an elk to save its life is the strange paradox that occurred some time ago in Wyoming, where such animals are protected by strict game laws. A big buck, probably forced by heavy snows and severe weather to seek food near civilization, caught one of the prongs of his antlers in a snarl of more than 600 ft. of chicken fencing. When finally discovered by a passing game warden, the elk was held fast by the wire, which had become firmly anchored in some scrub oak. There was only one way that the warden could free the animal in safety. That was to cut off the tip of the antler with a rifle bullet. Being a good shot, the task presented no difficulty.

Before Using His Rifle to Free the Elk, the Game Warden Made the Photograph Reproduced Herewith

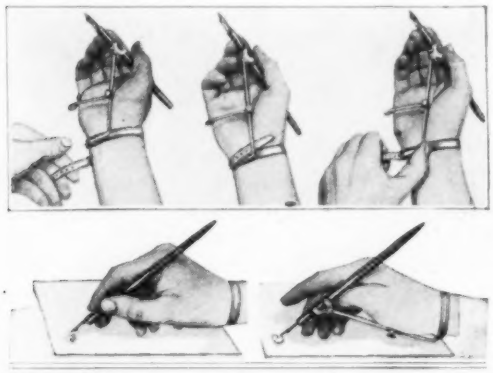
ENGINEERS' "CASTLE" MOTIF OF ARMY-CAMP CHAPEL

In constructing a chapel at Camp Wadsworth, Spartanburg, S. C., the 102nd Engineers have used the "castle," the collar disk that identifies members of the Corps of Engineers, as the architectural motif. To an army man, therefore, its appearance is strikingly significant. The structure is built of logs and seats about 300 persons. Except for a wooden cross surmounting the parapet above the portal, the façade is probably as exact a representation of the insigne as it would be possible to produce with the material employed.

Except for the Cross the Façade Is Almost an Exact Representation of the Engineers' Collar Device

PEN BRACE HELPS PUPILS WRITE CORRECTLY

Children can be easily taught muscular-movement writing, it is claimed,



Above: Adjusting the Brace; Below: The Brace Holds the Pen in Proper Position No Matter How the Holder is Grasped

by employing a new pen brace shown herewith. It consists of an adjustable arm with a clamp in one end that holds the pen at the proper angle, the brace being held in position by a wrist strap. The device compels the writer to keep his pen in the correct position and also keeps the hand from becoming cramped.

PLANK RUNWAYS LESSEN STRAIN ON BRIDGES

A majority of the highway bridges in a region in the Southwest have been

The Plank Runway on This Highway Bridge Enables Automobiles to Pass over It with Scarcely Any Vibration of the Structure

provided with runways of planks laid lengthwise. In passing over them automobiles make practically no noise, and because the resulting vibration is very much less than when running on the bridge floor itself, made of planks placed crosswise, the wear and tear on the structure is reduced. The improvement makes it unnecessary for cars to slow down.

MANY VICTIMS OF HALIFAX EXPLOSION BLINDED

One of the many tragic results of the Halifax disaster of last December was the heavy loss of eyesight among victims of the "Mont Blanc" explosion. The blizzard of splintered glass produced by the terrific detonation rendered 32 persons totally blind. The fate of some 229 other citizens remains yet to be determined. Of this number there are 58 who may lose the use of both of their eyes, and 171, each with one eye in doubt. In another group are 124 individuals, each of whom has lost one eye. A similar number of others sustained injuries of both eyes, from which they have recovered. Of 107 other victims, seven have died, and the condition of the remaining 100 is unknown. In connection with these statistics, it is a strange fact that middle-aged women were the chief sufferers. Eighteen of the totally blind, 41 of those with both eyes in doubtful condition, 127 with one eye in question, and 85 of those blind in one eye, are women. Among children, twice as many girls as boys were injured.

PIANIST'S FINGER REPLACES THUMB LOST IN WAR

Among recent examples of the remarkable work that is being performed almost hourly by the war surgeons is the case of a young soldier whose right thumb, after being shot away, was replaced with the third finger of the left hand. The operation was carried out in order that the patient, a pianist in civil life, might continue his art.

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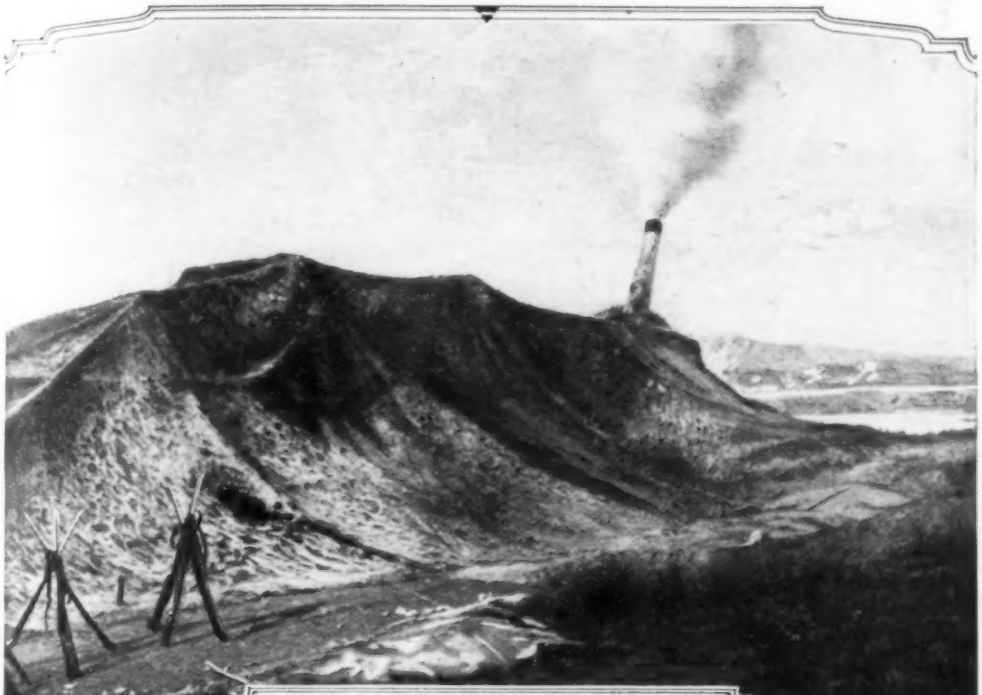
POWERFUL ANTI-HUN ENGINES OF DESTRUCTION



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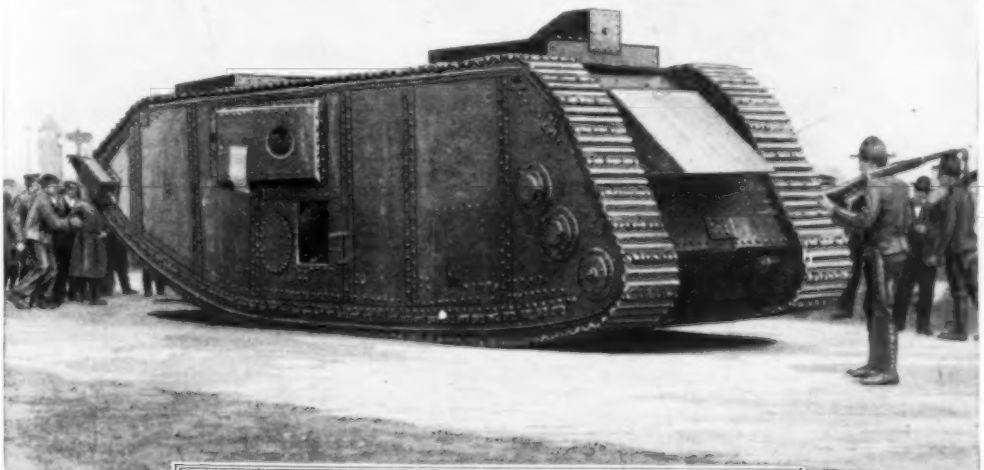
Carefully Hidden beneath What Appears to Be an Artificial Hillock of Framework and Canvas, a 16-Inch French Gun Is Pounding an Important German Position from Long Range. Only the Muzzle End of the Barrel Is Visible. The Size of the Gun and the Character of the "Hillock" Seem to Indicate That the Former is Mounted on a Railway Carriage



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Up to the Present Time Fritz has Not been Introduced to This Creeping, Shell-Spitting Land Dreadnaught of American Origin. It is Supposed to Be the Largest Type of Tank Thus Far Produced and was Recently Photographed at an Atlantic Port

SOME OF SAM'S SONS AT REST, PLAY, AND WORK

Some of Camp Gordon's Boys on a Hike to Atlanta, Enlisting the Services of a Friendly Fire Plug and an Equally Friendly Gutter and Curb. Cool Water Is Kind to Tired Feet, and These Fellows Have Both

Members of the Marine Corps, 800 of Them, Putting Real Life into Their Well-Advertised Slogan: "First to Fight"

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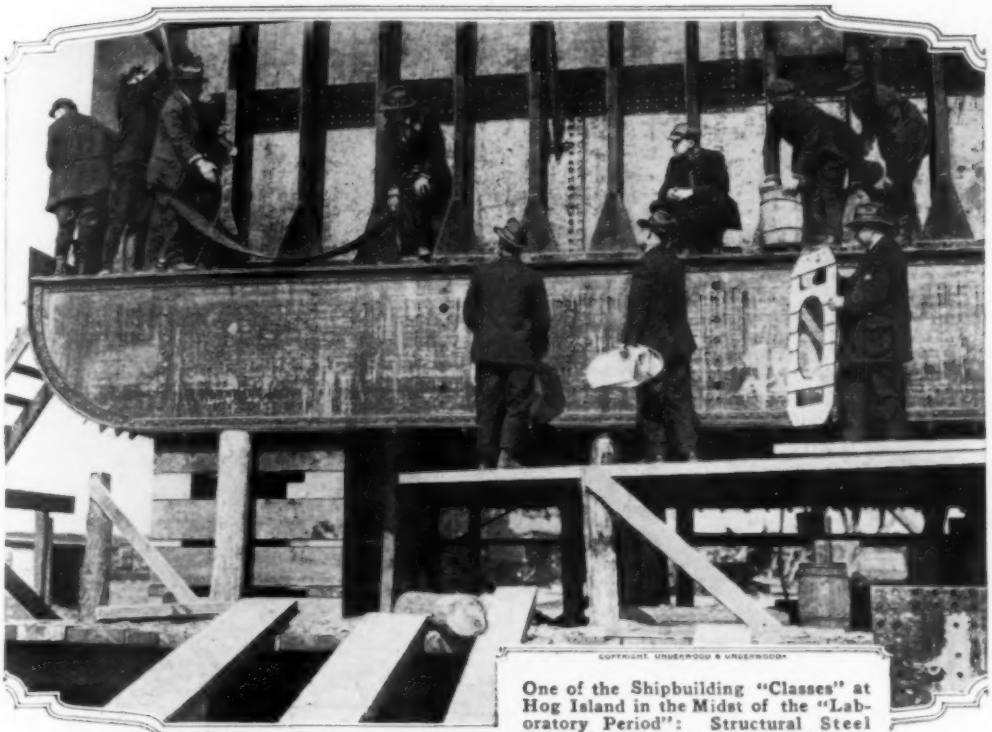
To Be Able to Say the Alphabet Backward Is Somewhat Like Being Able to Assemble, While Blindfolded and Timed by a Stop Watch, a Lewis Machine Gun in 70 Seconds. Such Little Tests, However, Are All in the Day's Work of a Student Airman

TEACHING TRADESMEN TO BE SHIPBUILDERS



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One of the Shipbuilding "Classes" at Hog Island in the Midst of the "Laboratory Period": Structural Steel Workers and Others Really Skilled in the Associated Building Trades Require But Little Tutelage to Fit Themselves for the Important Work in Hand

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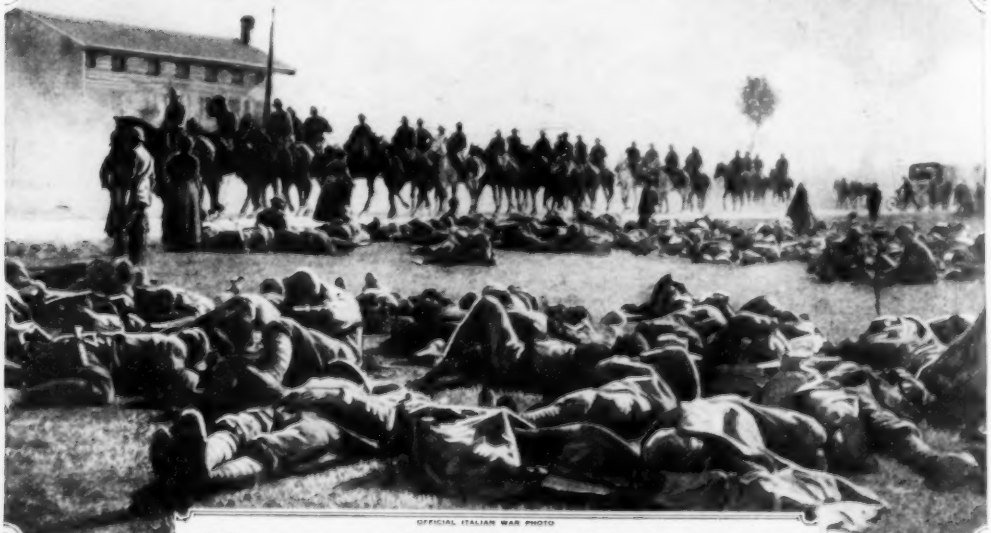
Like the Lowly Wash Cloth That Aspiring Red Cross Workers must Knit before Attempting More Difficult Articles, the Dummy Ship Receives the Amateur Shipbuilders' Practice Efforts. The Picture Shows a Heavy Steel Plate being Hoisted into Position

STRIKING WAR VIEWS FROM ITALIAN FRONT

OFFICIAL ITALIAN WAR PHOTO

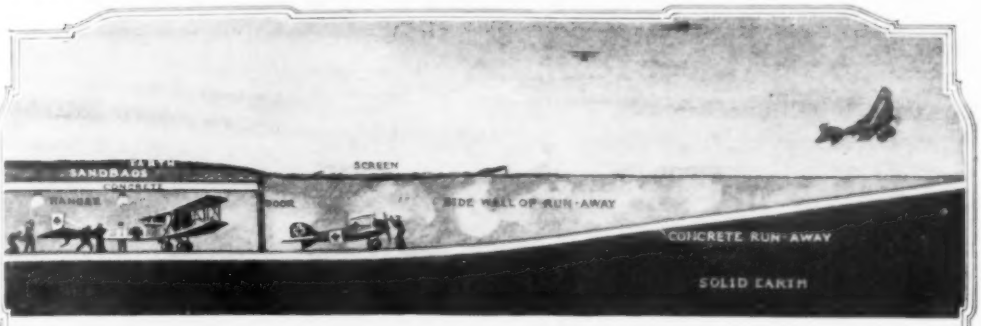
When Austrian Gunners Get the Range of This Military Highway and Shells Rain in Great Numbers, Soldiers Seek Safety in the Bombproof Shelters along the Wall on the Embankment. Italian Estates are Surrounded by Heavy Walls Instead of Fences, as in America, and Advantage is Here Taken of the Protection They Afford

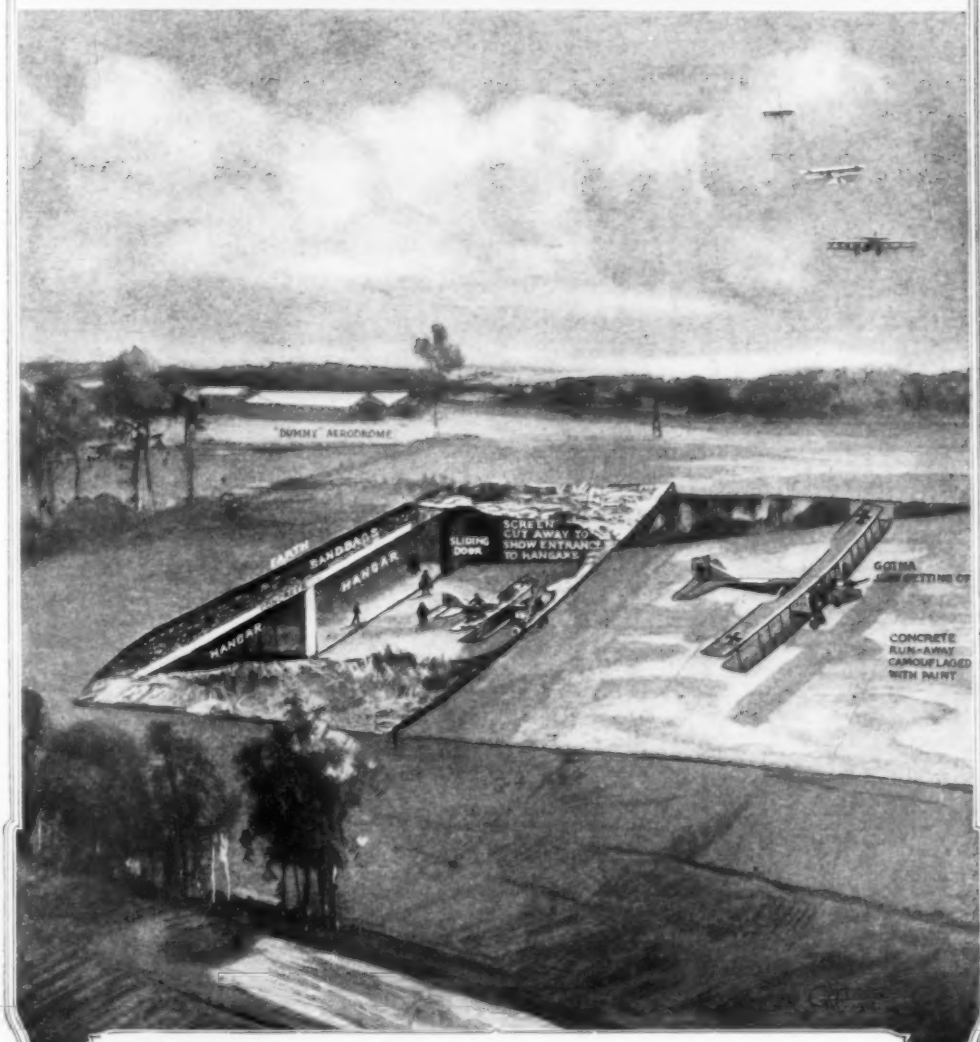


OFFICIAL ITALIAN WAR PHOTO

Italian Infantrymen, Exhausted by the Hardships of War, have Dropped Like Dead Men along a Roadside for a Brief Period of Rest. In the Background Cavalrymen are Passing on Their Way to the Front. The Picture Shows Recent Troop Movements in the Vicinity of the Piave, Where the Invading Austrians have been Stopped

GERMAN AIRMEN USE SUBTERRANEAN HANGARS





BECAUSE of the success that has marked British attacks upon German aerodromes in Belgium, the Huns have been forced to construct underground hangars for their air craft. Drawings presented herewith show how these subterranean sheds are built and concealed. A cross-sectional view at the top of the page amplifies the main picture. Steel doors close the entrance to the hangar, while a broad concrete ramp, camouflaged with paint, an overhead screen, and branches—the latter capable of quick removal—serves as an exit for the machines. Often a dummy aerodrome is erected some distance from the underground shelter to mislead British airmen.

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CLOSE-UP VIEWS OF GREAT WAR ENGINES

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Demonstrating the New Smoke Stick Used in the Field to Screen Troop Movements from View of the Enemy

This Trench-Digging Machine is Carried by a Heavy Motor Truck Which Provides for Quick Transportation in Times of Emergency. The Top, It will be Observed, is Covered with Boughs

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The Smoke Stick Is a Tube Containing Chemicals Which, When Ignited, Form an Impenetrable Low-Hanging Cloud. Its Density Is Here Apparent

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Within Range of German Positions, a Battery of Armored Railway Cars Equipped with Heavy Naval Rifles in Charge of French Marine Gunners: The Work of Camouflage Artists Is in Evidence

AND LATE ACCESSORIES USED BY FRENCH

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Mud Bridges, Made of Sheet Metal, being Carried to a Gummy Sea of Mire, There to Form Paths along Which French Soldiers can Walk without Sinking Waist Deep into the Oozy Ground

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The Loud-Speaking Master of Ceremonies in French Attacks against the Unspeakable Hun: This Is the Latest and Biggest Type of Heavy-Duty Tank Used by France's Defenders

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Sending a Message to Fritz: The Detonation of a Big Naval Gun Mounted on a Railway Carriage. The Postures of the Poilus and the Little Dog Are Expressive

WHERE THE ITALIANS FACE GERMANIC LEGIONS

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Speaking of Concrete Boats, Here Is a 60-Foot Barge That Is the Floating Foundation of a Powerful Naval Gun Used by the Italians on the Piave. This, Perhaps, Is the Most Convincing Demonstration of the Strength and Durability of Concrete Vessels That has Thus Far been Made

This Is What War Means to People of an Invaded Country. It Is the Destitution and Misery That Liberty Bonds Help to Keep from American Shores. The Picture Shows Refugees of Northern Italy Sheltered in the Basement of a Palace at Padua during the Bombardment of That Defenseless City

BABY SEA RAIDER CAPTURED IN PACIFIC

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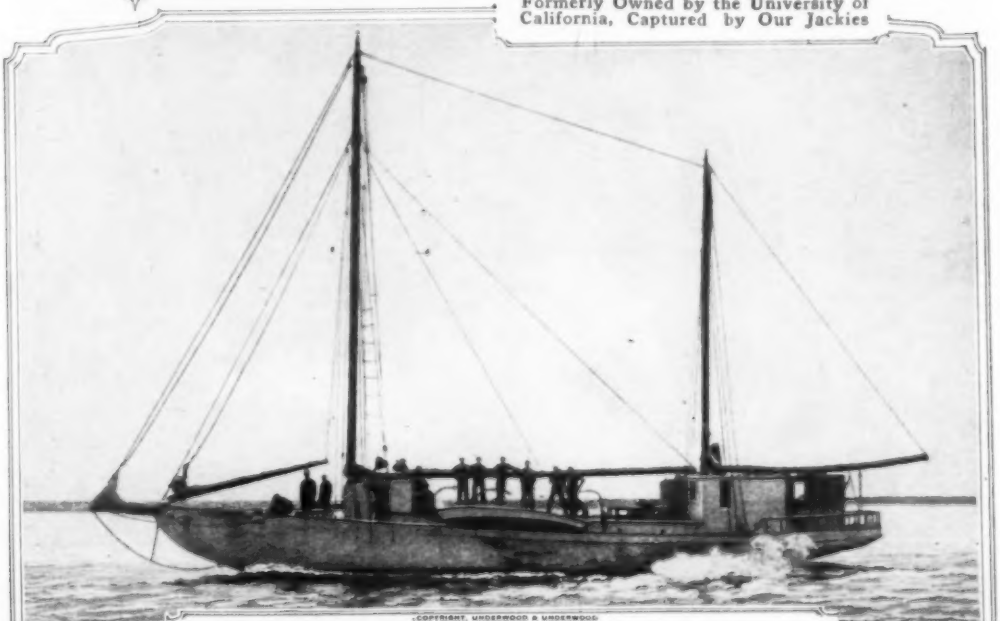
Five Unshaven Servants of the Master Butcher, Composing the Crew of the Small Schooner "Alexander Agassiz," Formerly Owned by the University of California, Captured by Our Jackies



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Germans at Mazatlan, on the West Coast of Mexico, Acquired the Vessel from a Defunct Trading Company and Set Forth to Prey on Shipping in the Pacific. Their Career as Pirates Was Breathlessly Brief, for American Warships Awaited Them at Sea

PLEASE PASS THE LIBERTY BONDS

So Urgent Is the Need of Farm Labor in Hunland That Blind, Maimed Soldiers have been Pressed into Service. This Shows a Group of Them on the Way to the Fields

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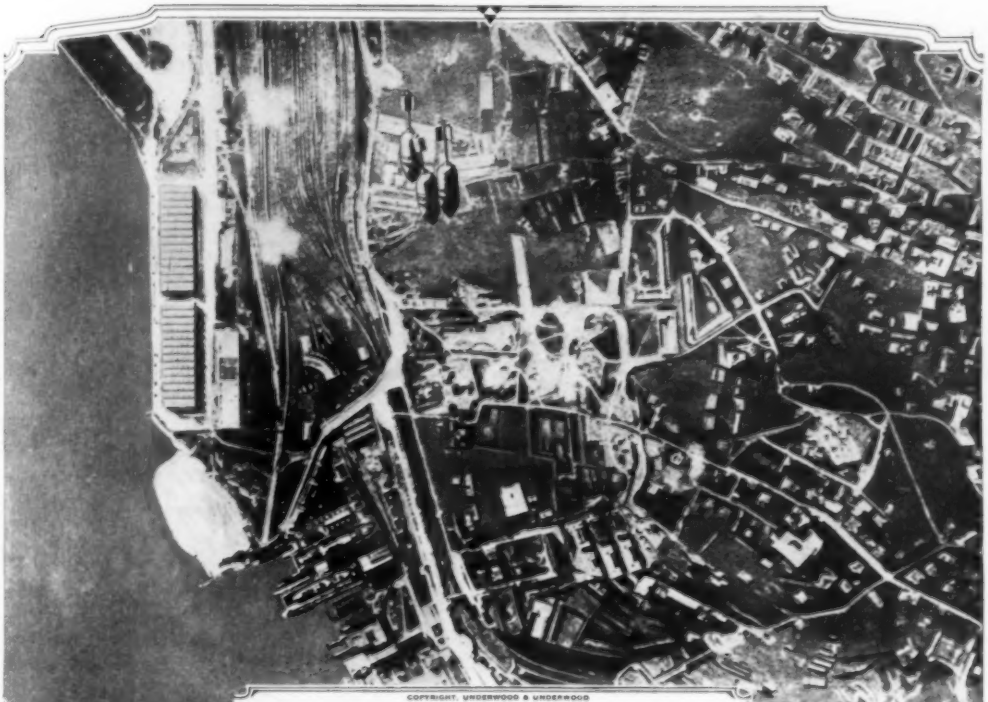
Picturing the Entertainment Afforded Russians Captured After the So-Called Peace Negotiations at Brest-Litovsk were Concluded

Wilhelm and His War Map Are Inseparable. Here He is Shown Holding It While Conversing with Emperor Charles of Austria

A Roadside Scene in Crucified Serbia Where Hideous Crimes, Equaling if Not Surpassing Those of the Turks in Armenia, have been Perpetrated by the Austrians, First Cousins of the Huns, the Standard Bearers of Cain. The Men Swinging by Their Necks were Civilians, According to the Serb Who Escaped into Switzerland with the Picture

AERIAL BOMBARDMENT OF AUSTRIAN NAVAL BASE



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Three Bombs, Launched Simultaneously from a French Plane, Falling upon Trieste, Austria's Important Adriatic Port: The Picture was Taken during an Attack That Centered on the Water Front Where Great Railway and Shipping Terminals, Supply Depots, and Naval Establishments are Situated

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French Aerodrome on the Western Front as Seen from Above, with Planes, Hangars, Supply Depots, and Barracks Plainly Visible: The Small Objects within the Square, Formed by the Barracks and Supply Buildings, Are Motor Trucks Attached to the Service

GLORY OF FRANCE IS THEME OF STRIKING BANNER

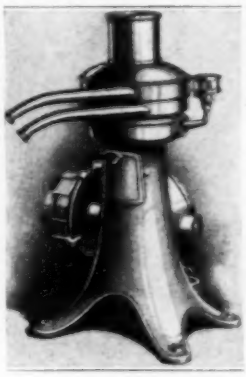
Unusual in design and symbolism is a banner that is being displayed above a certain New York mansion where an exhibit of French war paintings is being held for the benefit of France's invalid soldiers. From a crown of thorns at the top of the banner fall heavy drops of blood that change to varicolored flowers that form a garland at the bottom. Thus the sacrifice of humanity's gallant defender and the glory that is coming of that sacrifice are strikingly portrayed.

PROCESS MAKES PRACTICAL USE OF CROSSBRED WOOL

Crossbred wool, which has been considered too long and too strong for general use in textile mills, can now be made suitable for such purposes by a new carding process. The fibers are reduced to lengths of from two to seven inches, according to the use to be made of them, and are mixed with other wool, rag wool, shoddy, or cotton. The fabrics produced from the new mixture are soft and full instead of hard and wiry. The inventors claim that the process will do much to relieve the present wool shortage by making it possible to utilize millions of pounds of the crossbred material that is to be found in New Zealand, Argentina, Canada, and this country. Some of this coarse wool, carded into lengths for textile manufacture, is shown herewith.

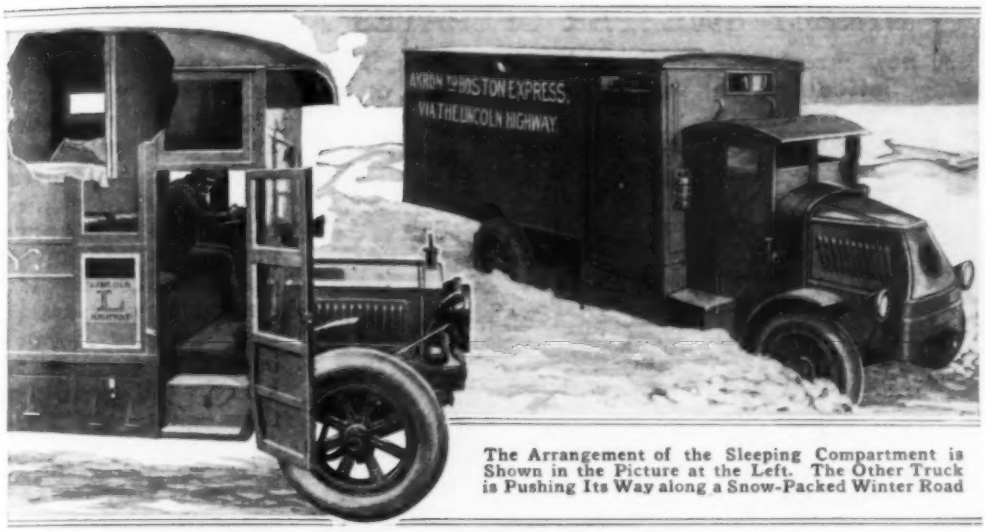
MAKES MILK POWDER, WATER, AND BUTTER INTO MILK

Transportation conditions, which have made difficult the shipment of milk and cream long distances, render particularly valuable an emulsor, now being widely introduced, which produces pasteurized milk or cream from their component parts with the aid of centrifugal force. The machine is built somewhat like a cream separator. Milk powder, butter, and water, which have been mixed and heated in a steam-jacketed vat, are fed at pasteurizing temperature into the revolving chamber, producing a perfect emulsion from which all foreign matter is eliminated.



RUST-CUTTING LIQUID AIDS MOTOR-CAR REPAIRING

Frozen, heat-bound, or rust-held bolts, nuts, thumbscrews, and turnbuckles may be loosened in a few minutes with the aid of a liquid preparation that is coming to be more generally known than in the past. For some time it has been used in motor-car service stations and garages, but has not been called to the attention of men who repair their own automobiles, farm implements, or other machines. Although it readily cuts grease, rust, paint, tar, and dirt, it does not injure the basic metal or harm wood or rubber, according to the claims made. It is noninflammable and free from acid.



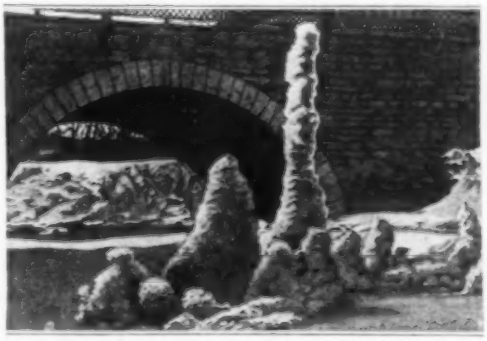
The Arrangement of the Sleeping Compartment is Shown in the Picture at the Left. The Other Truck is Pushing Its Way along a Snow-Packed Winter Road

AKRON-BOSTON MOTOR-TRUCK EXPRESS IS FAST SERVICE

Motor-caravan service has of late been inaugurated between Akron, Ohio, New York, and Boston. A fleet of eight big trucks, each in charge of two drivers, is operating on a regular schedule. Particularly interesting is the fact that these heavy machines are beating the fastest railway freight delivery between Akron and New York by 48 hours. They are completing the 533-mile journey in 60 hours total time and 49 hours actual running time. In the fore part of each van there is a comfortable bunk. Thus one driver snatches a few hours of sleep while the other mans the wheel. By alternating in this way, the pilots on frequent occasions have been able to finish the round trip between Akron and Boston, a distance of 1,480 miles, in six and a half days. The runs have been made through deep snow and in frigid weather when the thermometer has registered as low as 13° below zero. This interesting service, which must be of especial significance to the few surviving bullwhackers of prairie-schooner and frontier days, is maintained for two purposes. One of them is influenced by the prevailing freight congestion. The other, and less obvious, is that giant pneumatic truck tires are being used and thereby thoroughly tested. Incidentally, it is due to the fact that inflated, rather than solid, tires are used that it is possible to maintain the high average speed required by the schedule.

QUEER "ICE CHIMNEYS" FORM ABOVE AIR HOLES

Unusual and picturesque ice formations which have been called "ice chimneys" appeared above the surface of a New York creek during the cold weather last winter. Each of these queer upright growths was hollow and was formed by foam and air forced upward through an air hole. The chimneys sometimes reached a height of 20 ft. before toppling over.



Queer Ice Formations Which Grew above the Surface of a Creek as the Swiftly Running Water beneath Forced Foam and Air Up through Air Holes

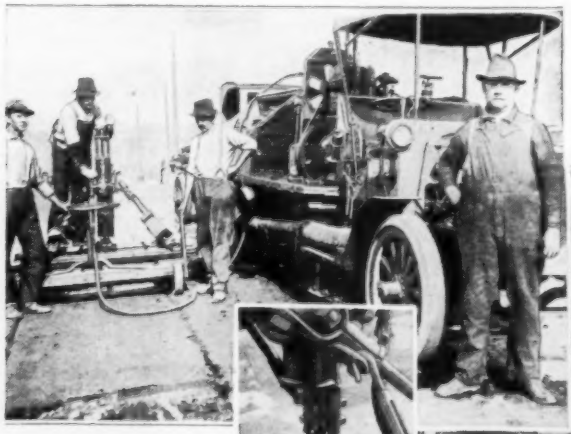
STREET SWEEPER OPERATES AT LOW COST

A new street-sweeping machine is being introduced in various cities, which, it is said, can be operated at 15 cents, or less, per 1,000 sq. yd., including the cost of hauling away the sweepings. A 40-hp. motor drives the sweeper at a speed of 10 miles an hour and pumps air into an 80-gal. tank, keeping water under pressure so that nozzles located beneath the machine spray the pavement thoroughly. The moist dirt is picked up by an 8-ft. revolving brush and thrown into a conveyor that discharges it into a wooden container. The capacity of the latter is approximately two wagon-loads.

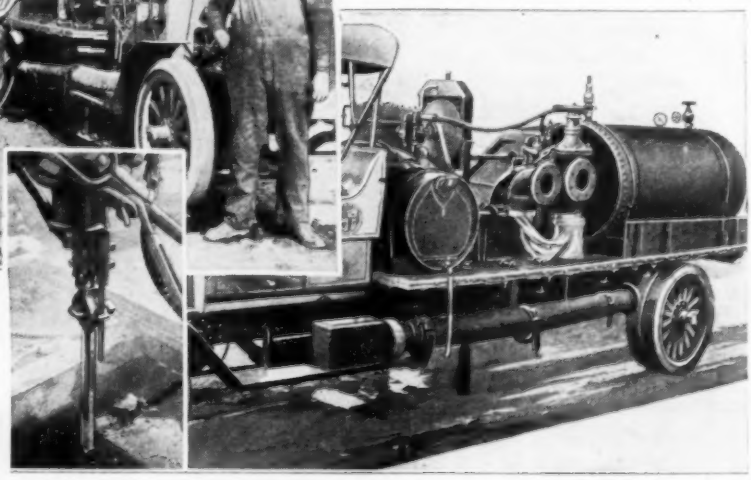
This Machine Sprays the Pavement Thoroughly and Then Picks Up the Dirt with a Revolving Brush. A Conveyor Discharges the Dirt into the Boxlike Container Mounted at the Front

CAR EQUIPPED WITH PUMP AND PAVEMENT CUTTER

A motor truck has been especially equipped by the city of Los Angeles for pumping water in emergencies and for cutting asphalt and concrete paving, a powerful pump and an air compressor being installed on the truck platform for these purposes. Both are operated by the 40-hp. car motor. The compressor supplies air to a pneumatic drill for which a convenient mounting has been de-



The Air Compressor Operating the Pavement Cutter Which is Mounted on a Special Carriage

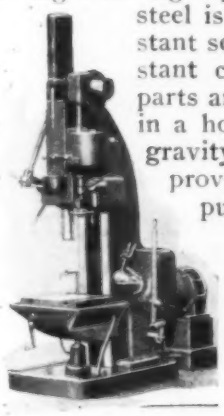


Left: Close View of the Drill Used in Cutting Paving. Right: Motor Truck Equipped with an Air Compressor and a Pump for a Variety of Public Uses

vised to facilitate the cutting of pavement. This consists of a low four-wheel carriage which can be moved forward or backward by a ratchet lever connected with one wheel. The drill can be shifted from side to side on the carriage by means of a steering-wheel attachment. With this outfit three men are able to cut away a strip of asphalt and concrete, 4 ft. wide and 120 ft. long, in a day.

NEW DRILLING MACHINE FOR HEAVY SERVICE

A new 24-in. drilling machine for driving 3-in. high-speed drills in solid steel is built to give constant service without constant care. The driving parts are entirely inclosed in a housing, in which a gravity oiling system is provided, the oil being pumped continuously to the top of the spindle and then flowing down and lubricating all the parts of the machine.



GROWING FOREIGN DEMAND FOR OUR CHEMICALS

There is every indication that permament markets are being steadily gained by American manufacturers of chemical products in all parts of the world. In the first nine months of 1917 the total exports in this line were $141,000,000, as compared with $121,000,000 in the corresponding period in 1916, and $54,000,000 in the first three quarters of 1915. In connection with this rapid expansion, students of foreign commerce are pointing out the necessity of making our export goods absolutely reliable in purity and strength. Even slight carelessness in these particulars would do incalculable harm at this time.

SELF-LOCKING WINDOW HAS NO COUNTERWEIGHTS

A new style of window has been patented in which the counterweights are dispensed with. Two ropes are attached to the upper sash, passed through pulleys fastened to the top of the frame, and down to the lower sash. At the bottom of the latter a hook is attached which automatically engages a metal loop in the frame when the window is closed, thus making both sashes immovable. The cost of this equipment, compared with that of counterweights and locks, is low.

CAMP TRAFFIC CONTROLLED BY SEMAPHORE

That our training camps are veritable cities, temporary to be sure but very busy, is shown by the fact that in one of them, at least, a semaphore is required to control traffic. The signal is mounted on a platform at the intersection of two streets, and is in charge of the local military police.

¶A new ink eraser, suited to the needs of draftsmen and others, is made of red rubber which is more pliable than that used in many ink erasers. While containing sufficient grit to remove ink lines, it will not harm tracing cloth or roughen Bristol board.

SPECIAL UNDERWEAR HELPS SAMMIES FIGHT VERMIN

A special sort of underwear disinfected against trench lice is being made in considerable quantities by patriotic

Treating Underwear Made Especially to Protect Soldiers at the Front against Trench Lice

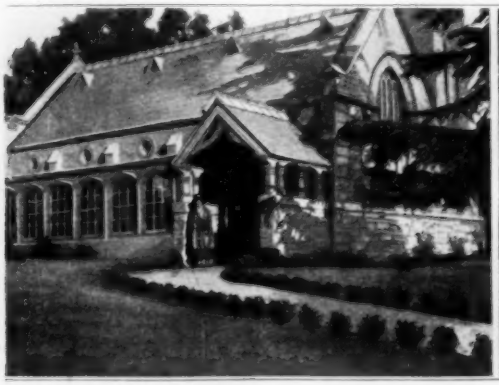
societies for our soldiers in France. The lice which thrive in the trenches are not merely a source of great discomfort, but transmit disease. The suits are made of thin, inexpensive material, and are designed to be worn a week or so and then thrown away. Sulphur and naphthalene are among the ingredients employed in treating the garments.

ILLITERATE DRAFTED MEN A SERIOUS PROBLEM

The war has thrust a schoolmaster's task of tremendous proportions on our government. Because there are 5,500,000 persons over 10 years of age in this country who cannot read and write in any language, the Secretary of the Interior has urged congress to enact laws to remedy this situation. The figures quoted in this connection are startling. There are nearly 700,000 men of draft age in this country who are illiterate. Aside from the big economic loss which such ignorance entails, there are vital military considerations involved. These men, of whom between 30,000 and 40,000 are already in the army, cannot read the orders posted on the bulletin boards, they cannot read the manual of arms, nor understand signals given by the Signal Corps in time of battle.

CONSERVATORIES BEAUTIFY HOUSE OF WORSHIP

A handsome Gothic church in the West, appropriately called "The Little Church of the Flowers," is unusual in that a series of archways on either side of the auditorium open into conservatories. These are filled with a wealth of plants, including rare begonias, palms, and ferns, while from the center of each arch hangs a fern basket. The effect produced is most pleasing.



In the Exterior View One of the Two Conservatories Forming a Part of This Novel Church can be Seen at the Left of the Entrance. An Interior View Looking from the Auditorium through the Arches into One Conservatory is Shown at the Right

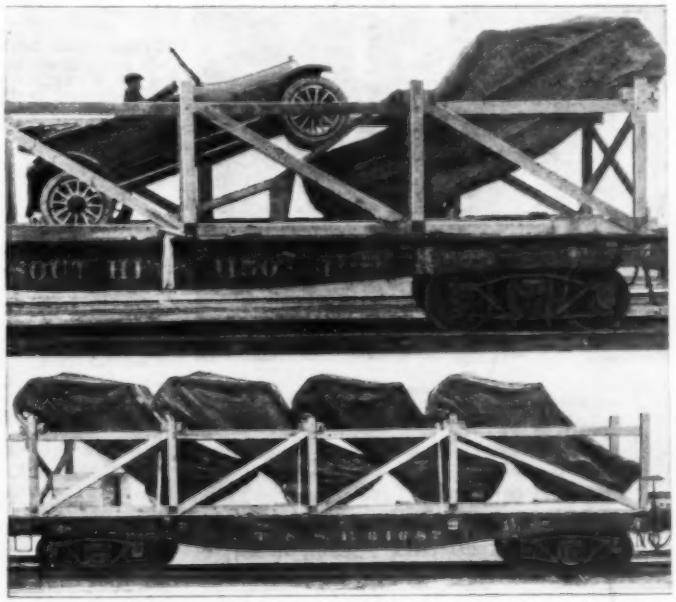
VIEWPOINT OF WOUNDED MEN LEARNED BY SURGEONS

Even the most serious work at times has its amusing phases. A particularly good instance is afforded by a practice that is observed nightly at a Philadelphia institution where a surgical unit is familiarizing itself, while awaiting orders to proceed overseas, with the apparatus used in field and base hospitals. So that the officers may have a double perspective—that of the patient as well as their own—they take turns being "wounded and operated upon." That is, the "chosen ones" have their limbs placed in splints and stretching frames as if they had polysyllabic fractures, and are left, bandaged and roped, for the night. During the still hours that follow, the surgeon-patients have plenty of time to acquire the soldier's point of view.

Not So Painful as It Looks, but Perhaps "Cruel and Unusual:" Two Army Surgeons are being Prepared for a Night-Long Demonstration of How It Seems to Be a Wounded Soldier

SPACE-SAVING WAY OF LOADING AUTOS

By adopting a new method of loading automobiles for transit, one factory has materially reduced its requirements for railway rolling stock. Four machines, instead of two as formerly, are being shipped on one flat car. The space saving is effected by tilting the vehicles at an angle of about 33° and thus enabling one to overlap another. This necessitates the construction of a heavy staging with crossbars that support the front wheels of each machine at a height of several feet. The practice is a car-saving, not a money-saving, one, primarily, for the cost of loading in this manner practically offsets the reduction in freight rates. In these days of car shortage, however, the plan has worked out admirably.



Above, One Auto in Position and Another being Driven into Place: Loaded in the Usual Way These Two Machines would Fill the Car. Below, Four Machines Occupying the Space Heretofore Given to Two: The Shortage of Railway Cars has Developed This Means of Conserving Space

PORTLAND'S FISHING BOAT REDUCES LIVING COST

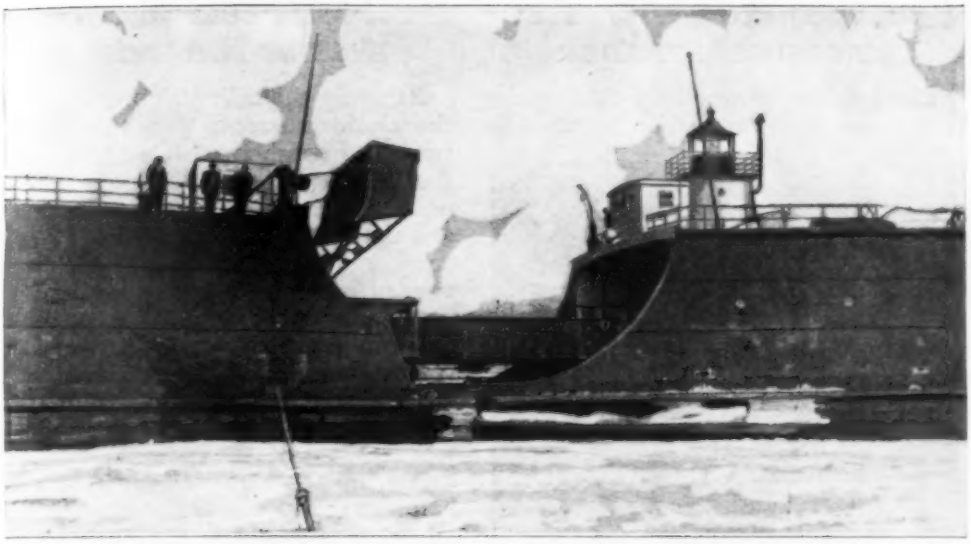
One of the most recent municipal enterprises aimed at lessening the high cost of living is the operation of a fishing boat by the city of Portland, Ore. For some reason the city's fish market, opened a few months ago, was unable to obtain an adequate supply of fish, and so this vessel, a large gasoline schooner that served as a pilot boat, was fitted up by the city for fishing expeditions. Halibut, ling, cod, red snapper, etc., have been caught in large quantities and prices for fish have been greatly reduced in consequence. The city has also conducted a campaign in which the people have been taught how to prepare varieties of fish that are plentiful but have been little used heretofore.

Top View: The City's Fishermen Laying a Line in the Halibut Banks. Lower View: The "Joseph Pulitzer" Which was Fitted Out by the City of Portland, Oregon, as a Fishing Boat

A Sample of the Fish Caught—a 105-Pound Halibut—and Placed on Sale in the Municipal Market

TEST METAL-COATED SEEDS IN ELECTRIFIED SOIL

Considerable interest is being created by an altogether new system of soil electrification that may eventually prove meritorious. Its two outstanding features distinguish it from the methods that have been employed abroad. Instead of an expensive overhead network of wires being erected, two distributing electrodes, consisting of insulated wires with pointed copper projections at 6-in. intervals, are imbedded, parallel with each other, in the ground along opposite sides of a field. These subsurface lines are extended to a depth of about six inches and are so situated that they do not interfere with cultivation. The current, stepped up to about 20,000 volts by passage through a high-frequency apparatus, is in this manner "sprayed" through the ground. In passing across the field from one electrode to another the current, following the path of least resistance, seeks out the seeds, which are metal-coated. The condition thus created is described as being analogous to the coherer of a wireless set. In laboratory germination tests really remarkable results have been accomplished. Field tests were conducted last season with encouraging, although not at all conclusive, results. In the minds of impartial experts who are familiar with the laboratory and field tests, the system is



Moving Coal Cars from One Ferry to Another in Mid-Lake: In Order That a Cargo of Much-Needed Coal, on the Ferry Caught Fast in the Ice, might be Delivered, a Sister Ship was Backed Up to It, as Shown, and the Loaded Cars were Transferred

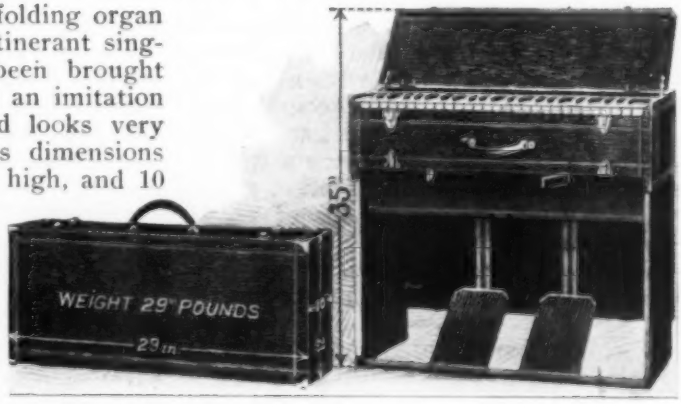
worthy of further experimentation, but at the present time not ripe for commercial exploitation.

CARS ON ONE FERRY MOVED TO ANOTHER IN MID-LAKE

A very unusual car-ferrying feat was performed during the intense cold weather last winter when two train ferries were locked together in mid-lake, off Frankfort, Mich., and a load of cars filled with coal was transferred from one to the other. One of the ferries had become fast in the ice, and a sister ship backed its stern up to that of the imprisoned boat so that the much needed fuel could be placed aboard the boat sent to the rescue. The water being perfectly calm, it was possible to lock the boats securely together and transfer the loaded cars from one to the other without any mishap.

IMPROVED FOLDING ORGAN LOOKS LIKE SUITCASE

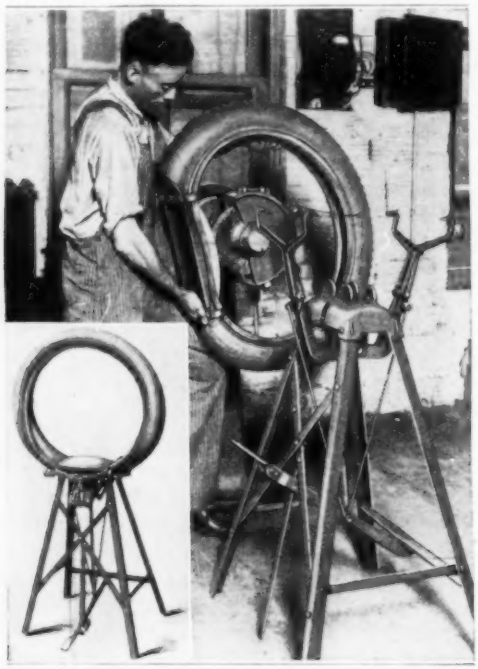
An improved type of folding organ for outdoor gatherings, itinerant singers, etc., has recently been brought out, which is finished in an imitation leather and when closed looks very much like a suitcase, its dimensions being 29 in. long, 12 in. high, and 10 in. thick. Open, it stands 35 in. high. The special reeds used give the instrument pipelike tones, it is claimed. It weighs about 29 lb. Only a moment is required to set the organ up for playing or to fold it into its case.



Improved Portable Organ Open and Closed: This Instrument is Designed Especially for Open-Air Gatherings and Measures 29 by 12 by 10 Inches When Folded Up

TIRE MENDING FACILITATED BY CASING SPREADER

Much labor is saved for the repairman through the use of an automobile



Here a Tire, Held Open by the Fingers of a Buffing Plate, is being Cleaned with a Revolving Brush, a Process That Eliminates the Expensive Use of Gasoline. The Spreader is Visible in the Foreground. When on the Spreader, as Shown in the Insert, a Tire may be Revolved for Inspection and Also Held in Working Position

tire spreader that has made its appearance recently. The device enables a casing to be turned practically inside out in a moment's time, so that breaks may be located and mended quickly and the surface cleaned with a buffing wheel, without gasoline. The apparatus consists of a stand, supplied at the top with nested rollers, on which a casing may be revolved for inspection when it is opened out by a pair of widespread claws. The rollers protrude through a buffing plate which engages a tire when repair work is in progress.

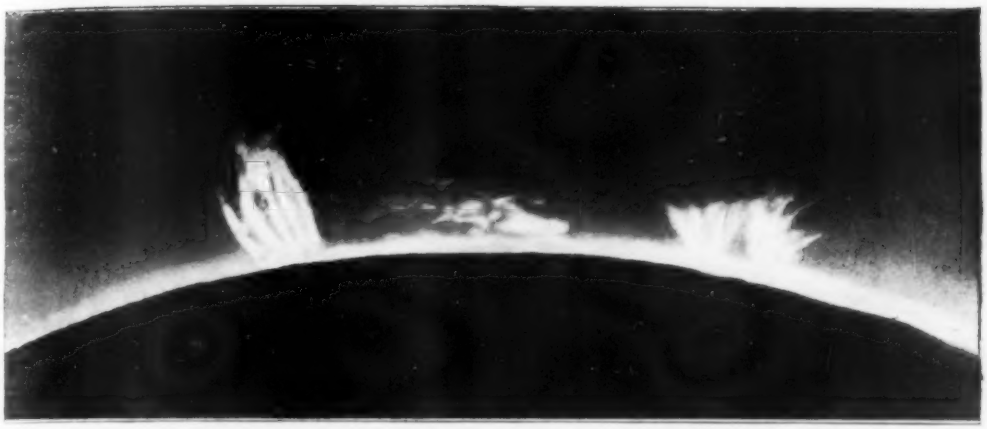
¶ Leading banks in Illinois have organized a syndicate to furnish $1,250,000 with which seed corn will be procured and placed at the disposal of farmers in need thereof.

PROPOSE DECIMAL COINAGE SYSTEM FOR BRITAIN

Recently three British organizations, the Decimal Association, the Association of Chambers of Commerce, and the Institute of Bankers, agreed on what they consider to be a convenient and desirable decimal system of coinage for their country. The changes they propose are being strongly urged. The pound sterling, universally recognized in the settlement of international transactions, would be retained as the British standard monetary unit. According to the new plan it would be worth 1,000 of the new submultiples called "mils." The gold sovereigns and half sovereigns would be retained. The silver coins would be the double florin, worth 200 mils or four shillings, the florin, half florin or shilling, and quarter florin or sixpence. The nickel coins would be ten and five-mil pieces worth 2.4 and 1.2 pence respectively. The bronze coins would be four, three, two, and one-mil pieces, the latter being worth .24 pence, or about one-half cent, United States money. The saving in time and energy that this system would effect is incalculable.

ROOFED METAL HOLDER FOR DAILY PAPERS

Wind and weather never mutilate the daily paper left at the home of the man who installed in his front yard the holder shown herewith. The upright supports a curved metal roof, beneath which are two spring arms. As the newsboy passes, he thrusts a paper under one of the springs, scarcely pausing an instant. There it remains, dry and folded, until the reader removes it.



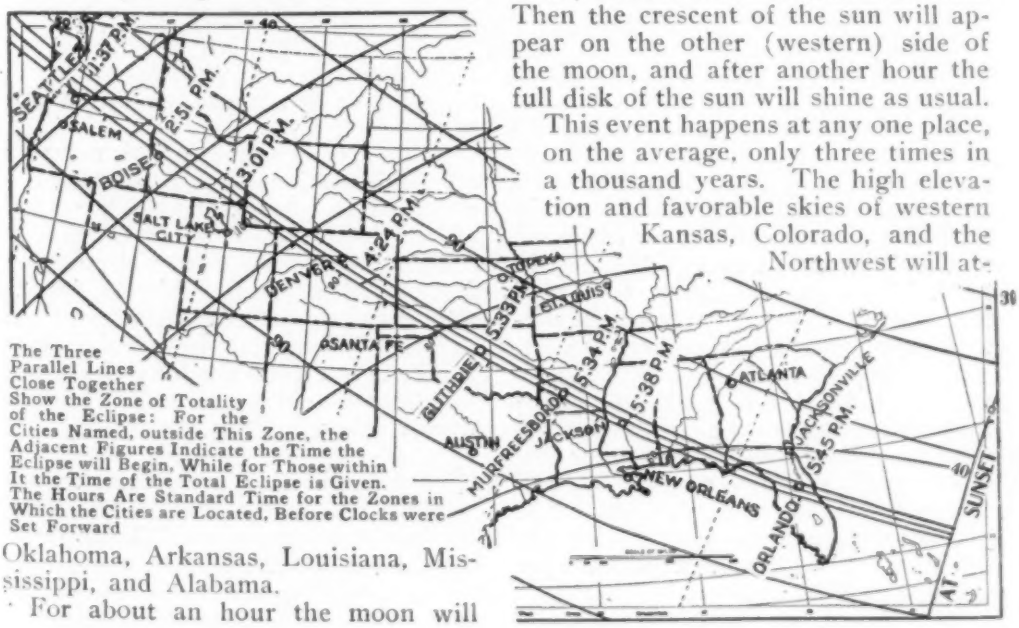
A Portion of the Sun's Rim as It Appeared during the Eclipse of 1900, Showing Eruptions Called Solar Prominences: Similar Prominences Probably will Be Visible through Small Telescopes during the Total Eclipse of June 8. The Prominence at the Left Was 40,000 Miles High

THE COMING TOTAL SOLAR ECLIPSE

By PROF. EDWIN B. FROST

Of the Yerkes Observatory

ON the afternoon of Saturday, June 8, 1918, the wonderful spectacle of a total solar eclipse will be visible, weather permitting, over a track extending from the Pacific (Washington) to the Atlantic (Florida). This track of the moon's shadow is 70 miles wide at the western coast, narrowing to 40 miles in Florida. It crosses also parts of the states of Oregon, Idaho, Utah, Wyoming, Colorado, Kansas, Oklahoma, Arkansas, Louisiana, Mississippi, and Alabama.



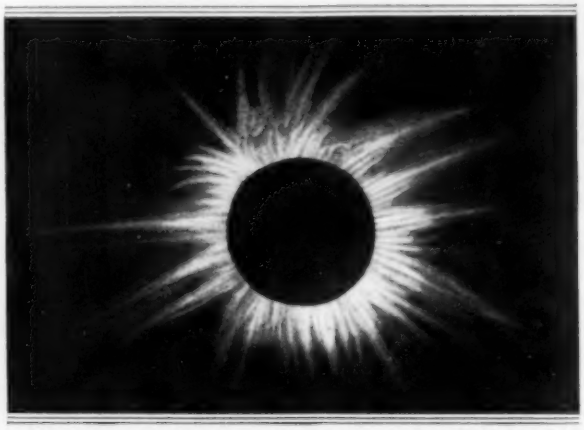
The Three Parallel Lines Close Together Show the Zone of Totality of the Eclipse: For the Cities Named, outside This Zone, the Adjacent Figures Indicate the Time the Eclipse will Begin, While for Those within It the Time of the Total Eclipse is Given. The Hours Are Standard Time for the Zones in Which the Cities are Located, Before Clocks were Set Forward

For about an hour the moon will gradually encroach upon the sun's disk, the daylight will fade, then the narrowing crescent of the sun will suddenly disappear, and around the jet-black ball of the moon, hanging in the northwestern sky among the brighter stars, will be seen the pearly radiance of the mysterious solar corona. The remarkable spectacle may be enjoyed for 122 seconds at the western coast, and for half that time in Florida. Then the crescent of the sun will appear on the other (western) side of the moon, and after another hour the full disk of the sun will shine as usual.

This event happens at any one place, on the average, only three times in a thousand years. The high elevation and favorable skies of western Kansas, Colorado, and the Northwest will at-

tract many visitors for the occasion. It is hoped that the film companies, after learning from the astronomers what apparatus is necessary, will obtain good records of the spectacle for the benefit of the public.

The last total eclipse visible in the United States occurred on May 28, 1900, and was well observed in the southeastern states, from Louisiana to Virginia. The next important one in America will take place in 1945.



The Kind of a Corona Astronomers Expect to See June 8: This Is a Composite Drawing of the Corona as It Appeared in 1905. It is Estimated That There Are Only About 90 Minutes in Every Century for Advantageously Investigating This Interesting Outer Appendage of the Sun

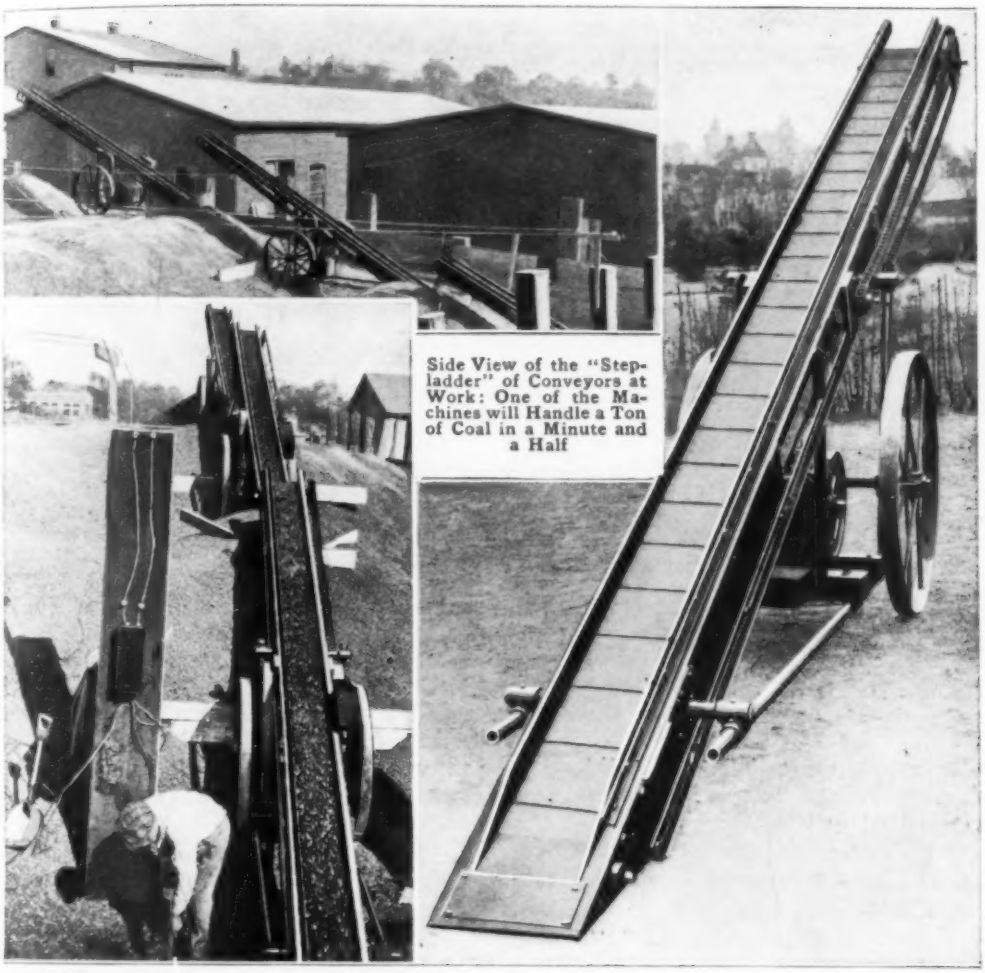
The gaseous envelopes of the sun can be advantageously studied by astronomers during the brief interval of total eclipse, and it is then only that the corona can be observed. It is estimated that there are only about 90 minutes in a century for the investigation of this interesting but still perplexing outer appendage of the sun. Its shape is not constant, but varies with the eleven-year cycle of the sun's activity in producing sun-spots. Sun-spots are now about at their maximum, and accordingly we may expect a corona with streamers distributed in all directions around the sun, but not so widely extended east and west as in 1900. The streamers issuing from near the sun's poles suggest somewhat certain appearances of the aurora borealis.

The light of the corona is partly reflected sunlight and partly radiation due to the intense heat it receives from the sun. But the most interesting part is due to an unknown gas, called coronium, which has not yet been found in the earth or in the spectrum of any other sun (i. e., star). The principal ray of coronium is green, but there are fainter rays in the red and in the violet parts of the spectrum. Chemists and mineralogists will probably some day find coronium gas shut up in some crystals, just as helium was found (on earth) in 1895, by Sir William Ramsay, in faint traces in the mineral cleveite from Scandinavia. It was at the eclipse of 1868, however, that the French astronomer, Janssen, who had taken telescope and spectroscope to India for the purpose, caught a golden ray in the spectrum which had never been seen before. The gas was promptly named helium, from helios, the Greek name for the sun. It has played an important part in the study of radio-activity, and the alpha rays emitted by radium are helium particles. The properties of coronium have already been predicted theoretically from the rays it emits, but we cannot tell what service coronium may render to humanity when it can be located on earth.

Many astronomers will visit the most favorable stations in the West for observing this eclipse, and every second of totality will be precious to them.

The eclipse will be partial over the rest of America. At Chicago, for instance, three-fourths of the disk of the sun will be covered by the moon in the latter part of the afternoon, but the dramatic climax of totality will be wholly missed.

¶ Large-scale electric welding, as applied to shipbuilding, is to be tested out in an eastern plant. The material will be assembled and tacked together by spot welding and rendered watertight by various forms of arc welding.



Side View of the "Step-ladder" of Conveyors at Work: One of the Machines will Handle a Ton of Coal in a Minute and a Half

Left: Three of the Conveyors, Each with Its Own Power Equipment, being Used in Series on a Big Coal Pile. Right: Close View of the Portable Conveyor, Showing the Feeding End Which is Pushed into Whatever Loose Material is to be Handled, So as to Minimize Shoveling

MOBILE MATERIAL CONVEYOR REDUCES LABOR CHARGE

To facilitate the loading and handling of various materials, a light, portable, motor-driven conveyor is being introduced that seems to have a wide range of application. It will transfer, for instance, a ton of coal from a pile to a wagon or car in about a minute and a half, according to claims made, and thus save considerable time and expense. The apparatus is designed to be operated by one man and to an important degree eliminates hand shoveling when crushed stone, sand, gravel, coke, ashes, or coal are handled. This is made possible by keeping the sharp nose of the conveyor buried in the material it is to move. The supporting frame is constructed of heavy piping and holds the power unit. Since it is mounted on two wheels, the device may be trailed from one job to another without difficulty. Boxes, packages, sacks, and similar containers, can be conveyed as readily as loose materials.

¶A plant known as "irguan" has been discovered in the region west of Mexico City which produces a red ink that is adaptable to various uses, it is believed.

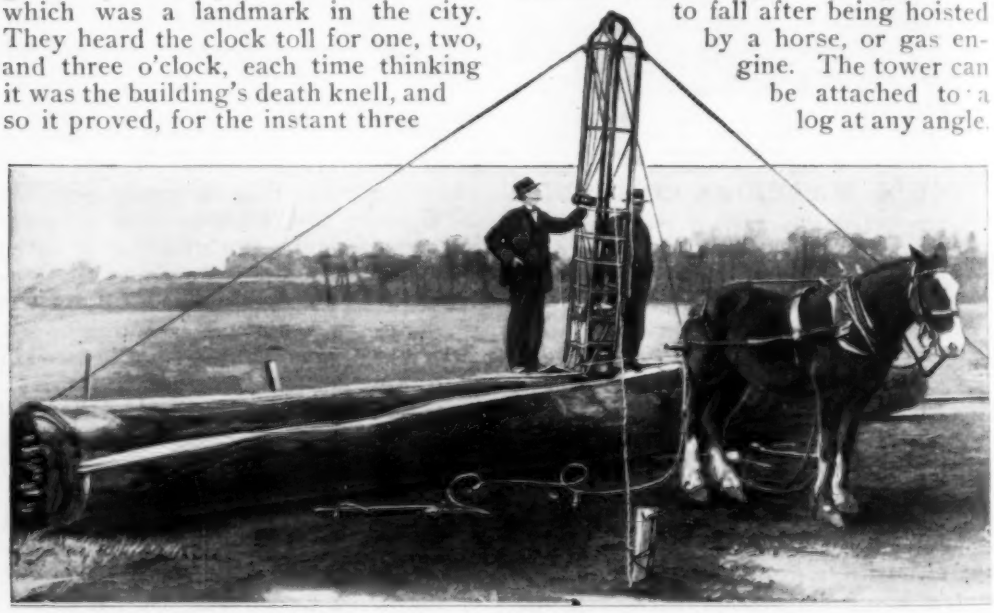
TOWER CLOCK TOLLS KNELL OF BURNING COURTHOUSE

One of the most spectacular fires in the history of Springfield, Ohio, broke out in the courthouse a few weeks ago, shortly after midnight, and in a few hours reduced the splendid structure to ruins. Many spectators were fascinated in watching the flames that gradually enveloped the clock tower, which was a landmark in the city. They heard the clock toll for one, two, and three o'clock, each time thinking it was the building's death knell, and so it proved, for the instant three o'clock had struck, the bell and clock crashed through the ruins to the basement. Much of value, including splendid furnishings and some historic paintings, was destroyed, but the county records, being in a fireproof vault, were not harmed. Over 30 prisoners who were confined in the jail adjoining the courthouse were hurriedly handcuffed together and taken to the city prison for safety.

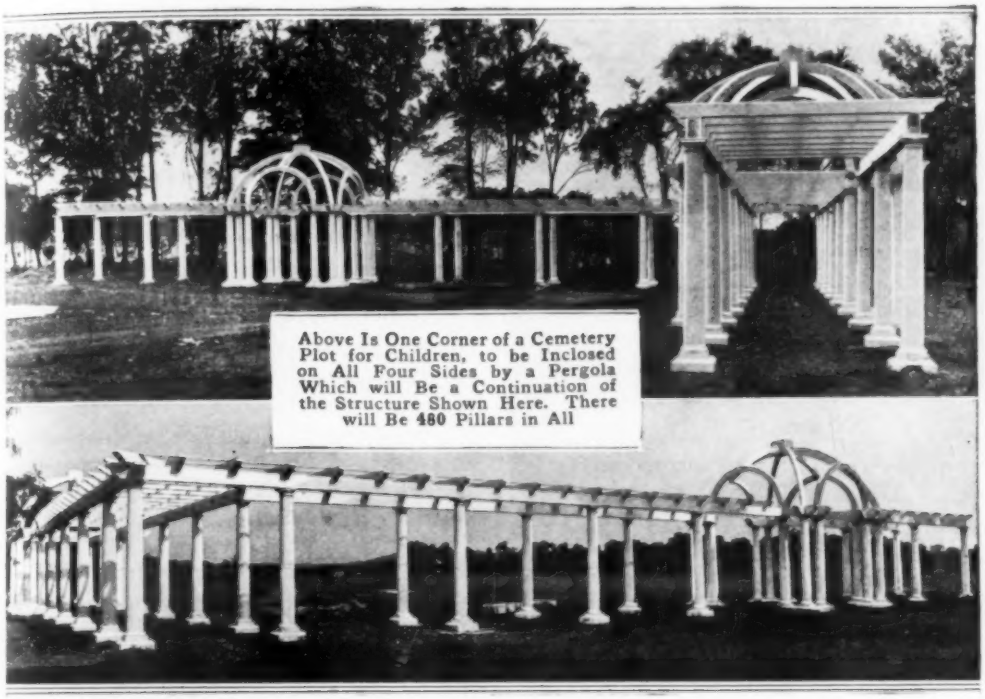
Midnight Picture of the Courthouse Tower in Springfield, Ohio, Showing the Flames Enveloping the Clock Which Struck the Hour Three Times before Falling into the Ruins

BIG LOGS SPLIT QUICKLY BY RIVING MACHINE

Scores of northwestern timbermen recently witnessed tests of a log-riving machine constructed and operated like a pile driver. Now that the government is taking all of the split spruce suited for aeroplane purposes that can be delivered to the new "cut-up" plant at Vancouver, Wash., much interest is being shown by lumbermen in the device which is intended to eliminate hand riving. During the demonstration a large log was split within four minutes after a crew of four men began to mount the machine on it. The contrivance consists of a steel guide, within which a weighted wedge is free to fall after being hoisted by a horse, or gas engine. The tower can be attached to a log at any angle.



The Tower can be Mounted on a Log at Any Desired Angle, as Indicated Above



COURTESY WILLIAM J. BEARDSLEY, ARCHITECT

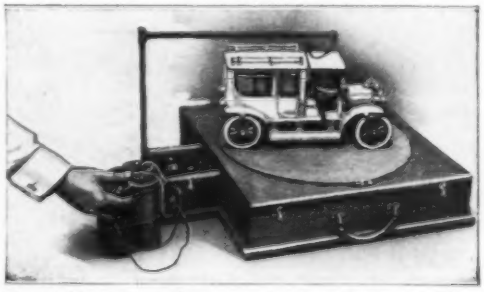
This Pergola will Eventually Have a Total Length of 1,632 Feet. Powdered White Marble and Waterproof Cement Are the Materials Used, Producing a Striking Effect. Each Pillar will be Sold as a Memorial to Some Child, and a Suitable Inscription will be Carved on It

BEAUTIFUL WHITE PERGOLA A CHILDREN'S MEMORIAL

There has recently been completed in a Poughkeepsie, N. Y., cemetery a portion of a beautiful pergola which eventually will contain 480 pure-white cement pillars and will have 12 arched entrances. It will extend around four sides of a children's burial plot, 408 ft. square, and will be without a counterpart in this country or Europe, it is said. Eventually each pillar will be sold to some family as a memorial, and on its side a suitable inscription can be carved. The columns, 10 ft. high and 14 in. in diameter at the base, are made of crushed marble mixed with white waterproof cement, producing a substance that sparkles in the sunlight and is nonstaining. They are first cast hollow, with reinforcing rods in the center, and then filled. In the center of the plot, on a low mound, a white chapel will be erected of the same material.

MODEL OF AUTO TURNTABLE FOR SALESMAN'S USE

For the use of a salesman introducing garage turntables, of the type described in Popular Mechanics Magazine some time ago, a model of the apparatus has been devised which can be carried in a small case. Supplementing the miniature device is a tiny automobile that can be placed on the revolving disk to show how the latter operates.



Model Used by a Salesman in Introducing a Turntable for Automobiles to Garage Men and Dealers in Motor Cars

CRIPPLED DOG "BICYCLES" FROM PLACE TO PLACE

Rubber-tired wheels serve the purpose of front legs for a Jacksonville,

COURTESY MOTORCYCLE AND BICYCLE ILLUSTRATED

Rubber-Tired Wheels Take the Place of Front Legs for This Crippled but Lively Little Fellow

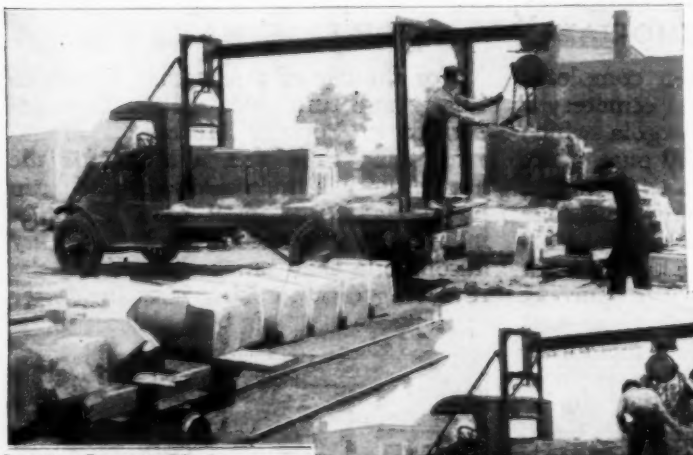
Fla., dog that was crippled when born. A couple of straps hold the little fellow to a board supported by the running gear. There is no lack of energy in the dog's hind legs or absence of intelligence in his head. So, thus equipped, he "bicycles" wherever he wants to go. And so cleverly does he do it that he never fails to amaze those who see him.

FURS WORTH MANY TIMES THEIR FORMER PRICE

The prices paid for furs at the annual fur auction held in St. Louis early in the year show how tremendously the value of these commodities has advanced in recent years. A lot of 710,000 muskrat pelts, which, it is said, would have formerly sold for as low as five cents apiece, brought $500,000. A collection of beaver skins brought $25 each.

MOTOR TRUCK IS EQUIPPED WITH LOADING APPARATUS

By supplying a motor truck with a special loading equipment, a certain manufacturer has met the problem of handling heavy concrete blocks with dispatch. Essentially the apparatus consists of an overhead track and a standard two-ton chain hoist. The former is 17 ft. long and projects about four feet beyond the rear end of the platform. A screw adjustment is supplied which keeps it level when the truck is standing on an incline. In three lifts, six tons of blocks can be loaded in three operations.



Loading Concrete Blocks onto the Truck with the Aid of the Hoisting Apparatus: A Time and Money-Saving Equipment of Simple Construction and Moderate Cost

A Screw Adjustment Keeps the Overhead Track Level When the Truck Stands on Uneven Ground. Six Tons of Blocks can be Loaded in Three Operations

be loaded onto or removed from the truck in about 20 minutes. Equipment of this sort seems to be particularly suited for handling marble, stone, and brick products.

VEIN OF COAL UNDERLIES BASEMENT OF HOME

The coal famine of last winter had no terrors for a family in Ottawa, Ill., for when, over a year ago, an excavation was made for their new home, a 22-in. layer of coal was found covering the entire area of the cellar. For the past two winters all the fuel needed has been dug from beneath the house. When the indoor supply, estimated at 45 tons, is exhausted, it is anticipated

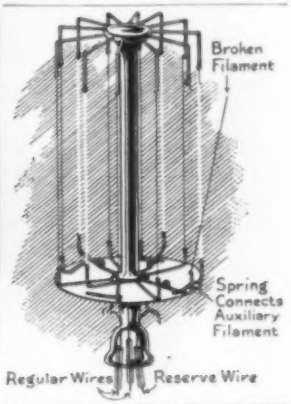
The Vein of Coal Underlying an Ottawa, Illinois, Home That has Supplied the Owner with Fuel for Two Winters

that there will be plenty available in the back yard.

SIX LIVES ARE POSSESSED BY NOVEL ELECTRIC LAMP

Automatic renewability is the distinctive feature of a high-power incandescent lamp that has lately been devised. It is supplied with 12 filaments. Four of these form the regular circuit and four of them a reserve one. The remainder are auxiliary members that are successively brought into service as those they stand ready to replace in the regular circuit burn out. In addition the candlepower may at any time be doubled by cutting in the set of reserve filaments. The auxiliary wires are attached to small rods anchored immediately below the springs by which the regularly connected fil-

When a Filament Breaks, Its Auxiliary is Automatically Connected in the Circuit So That the Lamp Continues to Function



aments are held. When one of the latter breaks, its spring falls against the rod of an auxiliary wire and forms a contact so that the unused filament replaces the disabled one. Finally, if all the regular and auxiliary wires burn out, the reserve circuit gives the lamp another lease of life.

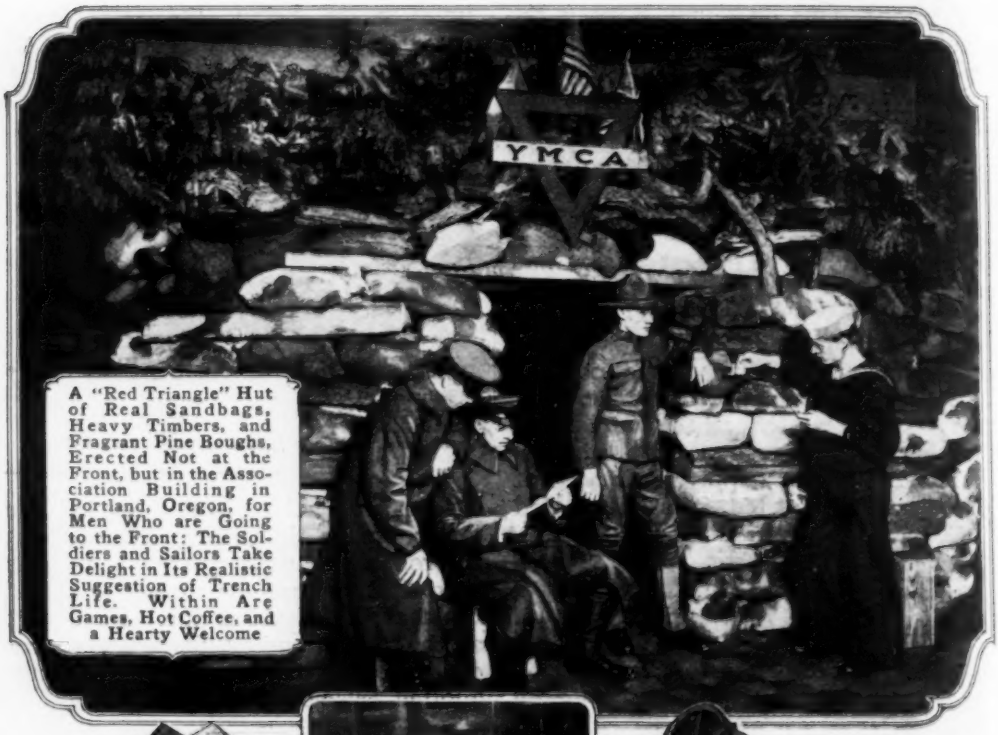
TRAP NEST SEPARATES HENS THAT LAY FROM OTHERS

A poultry keeper now employs a trap nest that automatically releases the hens using it, but enables him to keep track of the layers. When the nest is entered the entrance door closes, and as soon as an egg is laid, its weight opens a door that lets the fowl into a layers' yard. Here the laying hens remain until the owner releases them when gathering the eggs that collect in the compartment beneath the nest. Hens entering the nest but not laying

Left: Hen Entering the Trap Nest Which Closes Automatically When She Gets Inside. Right: Hen Which has Not Laid an Egg Emerging into the Yard from Which She Came

eventually push their way through a gate back into the yard from which they came.

CIVIC FEATURES THAT PROMOTE THE COMFORT



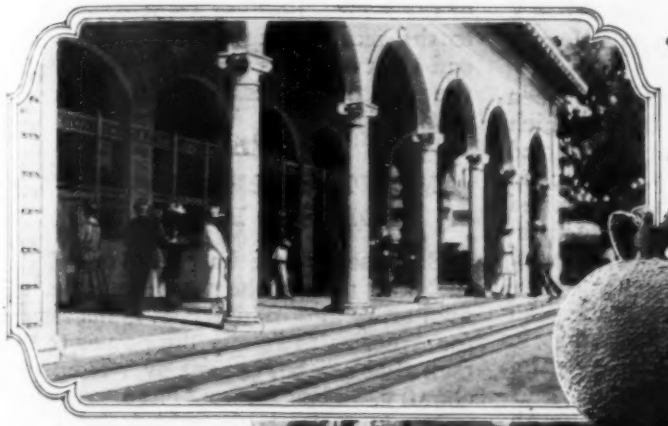
A "Red Triangle" Hut of Real Sandbags, Heavy Timbers, and Fragrant Pine Boughs, Erected Not at the Front, but in the Association Building in Portland, Oregon, for Men Who are Going to the Front: The Soldiers and Sailors Take Delight in Its Realistic Suggestion of Trench Life. Within Are Games, Hot Coffee, and a Hearty Welcome

Fire Plug in Buffalo, New York, Protected against Cold by Metal Case Filled with Straw

One of the Distinctive New Street Lamps in Seal Beach, California: The Appropriate Motif Is Three Baby Seals

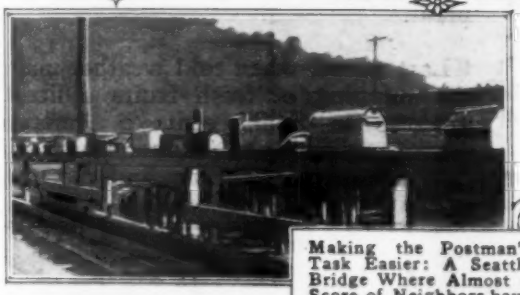
Liberty Tower Erected in Columbus, Ohio, during a Recent "Drive": Contributions were Announced by Ringing the Bell and by Posting Them on the Sides

AND ENJOYMENT OF RESIDENTS AND VISITORS



Left: New Open-Air Post Office at St. Petersburg, Florida. The Service Windows and Lock Boxes All Open on This Handsome Arched Portico. The Building Is Largely of Concrete

Patriotic Design in Sandusky, Ohio, Fashioned of Earth and Covered with Living Plants: The Soil for the Globe is Held Together by a Special Framework



Making the Postman's Task Easier: A Seattle Bridge Where Almost a Score of Neighbors have Installed Their Mail Boxes

Beware of Delay on This Military Road! It is Built for Speed and Connects Battle Creek and Camp Custer, Michigan

The Old Town Pump in Knox, Indiana, has been Modernized by Adding a Bubbling, Sanitary Drinking Cup

NEW DENTAL CAR FOR ARMY WONDERFULLY EQUIPPED

The government has recently been presented with a dental truck which is remarkable for its completeness and the ingenuity of its design. Attached to either side of the body and mounted on frames that fold up, jackknife-fashion, are tents that can be opened quickly when the car is at rest. These are used as living quarters for the men in charge and for professional work. One is equipped with a portable dental chair and an oil heater.

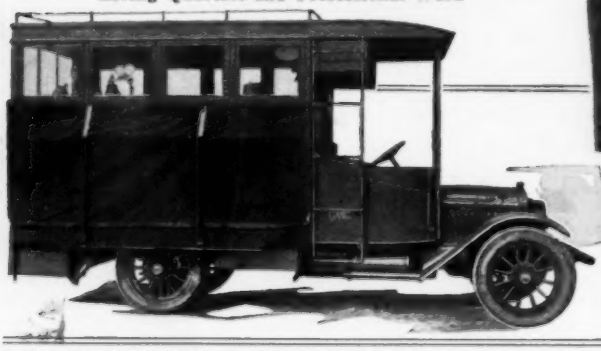
The body of the car is equipped with a regulation dental chair, a gas-administering outfit, spacious cabinets for instruments, a washbasin, 30-gal. water tank, rotary pump, etc. Acetylene gas is supplied from compression tanks for lights, a heater, and a brazing torch. Storage batteries supply current for auxiliary lights, a dental lathe, and an electric engine. The upper half of the end gate can be drawn up to serve as a continuation of the roof, while the lower half, when it is let down, is an extension of the floor. Folding steps give access to the rear. Hinged beneath the rear end are two jacks that are used to give the car the necessary stability when stationary.

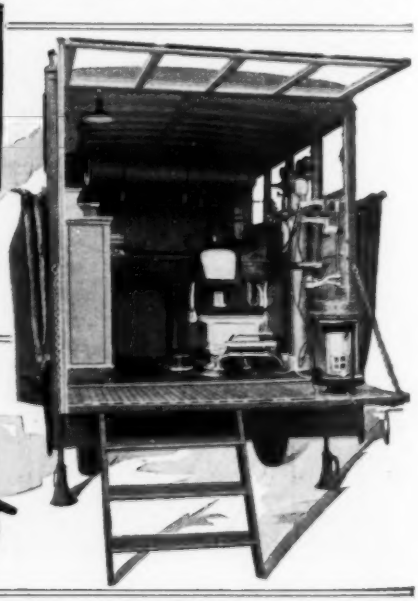
AMERICAN ELECTRIC POWER PROPOSED FOR FRANCE

Because France has need of all the fuel and power she possesses for her own army and industry, it is necessary for America to supply the power to the men that are being sent over from this country. Engineers have recently pointed out that we would do far better to develop hydroelectric power in France than to attempt to carry coal across the Atlantic. The money needed to construct two 5,000-ton steel colliers would build a 10,000-hp. hydroelectric plant in France, it is claimed, and two such vessels could carry across all the necessary machinery, etc., for such a plant.

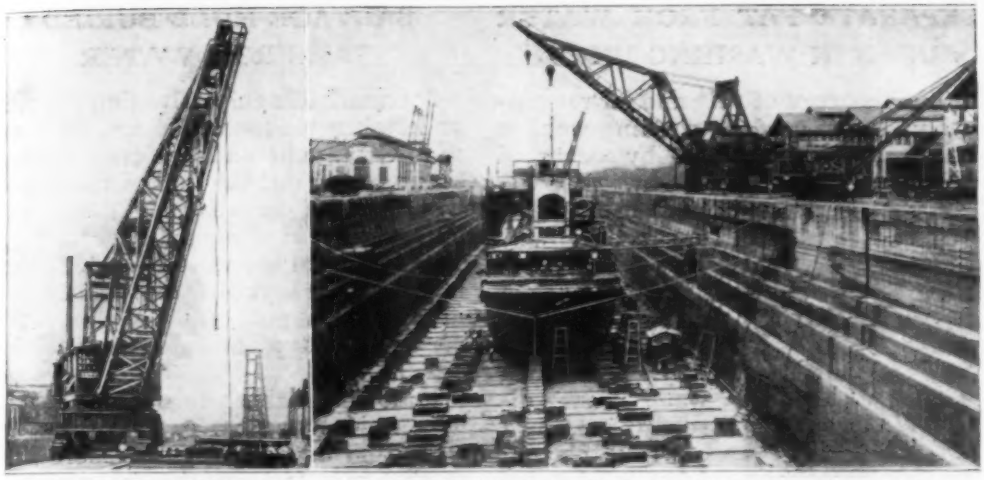
¶ Last winter when cold weather made the shipping of fresh fruits difficult, growers in Spain sent to America oranges sliced and canned raw, for marmalade making, and the like.

The Outfit Set Up for Service, the Tents being Used for Living Quarters and Professional Work





Left: Side View of Army Dental Car Showing One of the Tents Folded Up. Right: The Rear End Open, Showing the Dental Equipment, Water Tank, Bench, and Cabinets. The Tents are Folded against the Sides



The End-View Picture at the Left Gives a Fair Impression of the Size of the Crane Which Weighs 1,062,300 Pounds. The Other Picture Shows It in Use at a Dry Dock at Balboa

BIG CRANE HOISTS HEAVY LOADS AT PANAMA DOCK

For placing heavy turrets, guns, and boilers aboard warships in dry dock at Balboa, Canal Zone, a 500-ton locomotive crane is employed. This is supposed to be one of the largest hoists of its kind that has ever been built for handling heavy machinery. It has been in operation a comparatively short time and since our entrance into the world war has proved to be valuable equipment. It is constructed with a box-girder underframe that rests on eight two-wheel trucks and supports the revolving table carrying the jib, counterweight, hoists, boiler, and cab. The crane is provided with three separate hoists, the chief of which is rated to handle 50 gross tons at a maximum radius of 87 ft. Such a weight can be raised 55 ft. above the rails at a speed of 10 ft. a minute. The capacity of the auxiliary hoist, which has a working radius of 97 ft., is 15 gross tons at a speed of 20 ft. to the minute. The third, or whip, hoist raises three gross tons 40 ft. a minute. Its radius is 102 feet.

¶A staff of nurses from the Army Nurse Corps has been detailed to do welfare work among civilian employes of the War Department at Washington, D. C.

FLOWER OF JAPANESE FERN PALM EXCITES INTEREST

A Japanese fern palm, sometimes called a sago palm, in full bloom, was the beautiful sight which people in Sandusky, Ohio, enjoyed recently. While blossoms of this species are seen occasionally in this country, special interest attached to this flower because it was

Looking Down into a Japanese Fern Palm Showing the First Blossom Which has Appeared on This Plant in Over 22 Years

the first to appear on this plant in over 22 years. It measured 12 in. in diameter and its featherlike petals were a light-tan hue.

SEPARATE FAT FROM WATER USED IN WASHING WOOL

The recovery of valuable fat remaining in water used in washing wool is now being accomplished by means of a new machine resembling a cream separator. In the past various attempts to do this have not proven satisfactory. The wash water runs directly into a bowl making 6,000 revolutions per minute, and the fat is separated almost instantly, a particularly pure product being obtained. It is discharged through one spout while out of another dirt and water are sludged. The machine handles 800 gal. of wash water per hour and can be operated for long runs with little attention.

SALVAGE HULL BURIED FAR FROM WATER

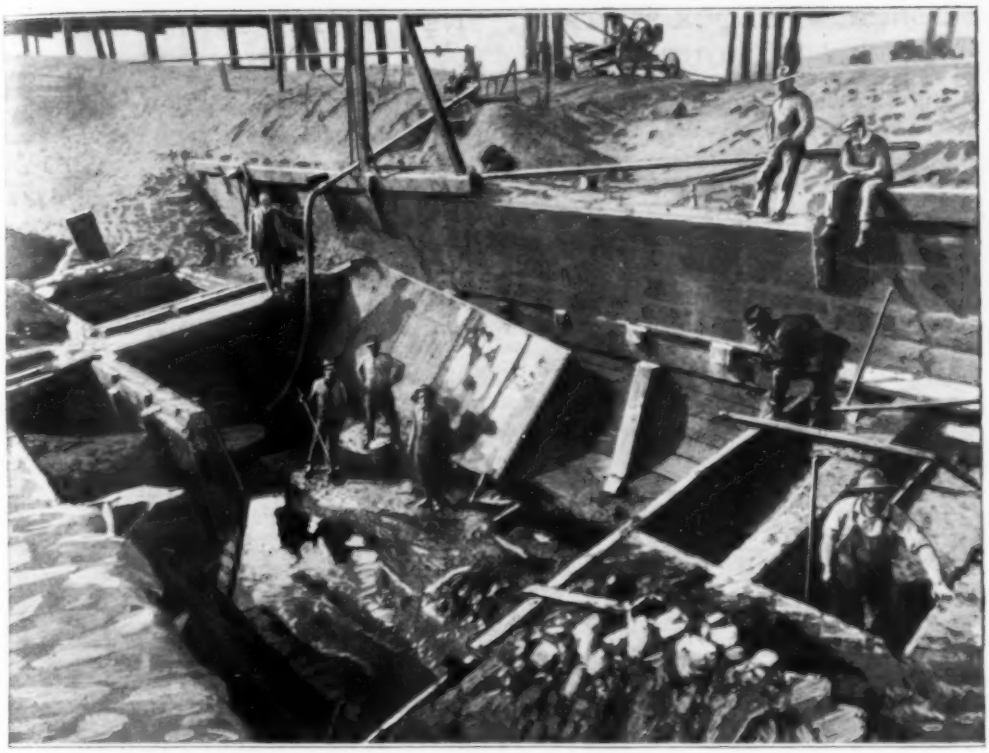
A remarkable ship-salvaging job was undertaken a few weeks ago at Ventura, Calif., when a large crew of men began to dig out the hull of the "Coos Bay," a 180-ft. schooner that was buried deep in the sand several hundred feet from the water. In 1914 this vessel, which cost $150,000, was caught in a sudden gale while tied to the dock at Ventura and driven onto the beach.

Following this misfortune high winter tides swept over it, covering it with sand and altering the shore line so that in a few months the craft lay buried far from the shore.

At that time it was considered worth while to remove only the upper works and the deck machinery. But with the soaring prices of all shipping materials, the discarded hull became a buried treasure, and the fact that it contained a considerable cargo offered an additional reason for unearthing it from beneath many feet of sand.

After a great deal of digging the

General View of the Remarkable Salvaging Job, Showing the 35-Ton Boiler being Drawn Out on Skids with the Aid of Block and Tackle

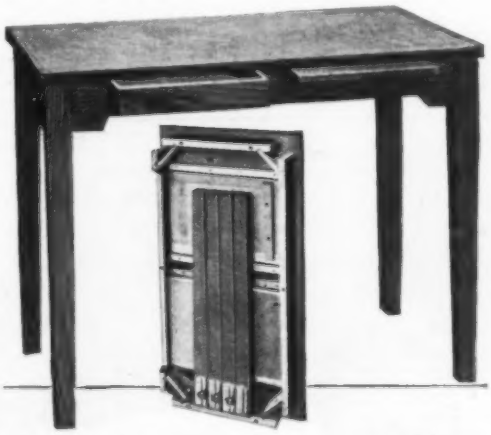


The Abandoned Hull That Became Buried Treasure: Workmen Uncovering the "Coos Bay," Which had been Hidden in the Sand for Four Years

sand was cleared away from above and within the hull, and $2,000 worth of metal, including zinc, copper, brass, and lead, was stripped from it. The boiler, weighing 35 tons, was with difficulty drawn out with tackle and windlass, and several large oil tanks were hauled up and will be used again. A large quantity of whisky which was recovered had increased in value because of its age, while canned goods taken from the hold appeared to be in as good condition as the day they were stowed away.

NEW TYPEWRITER TABLE IS COLLAPSIBLE

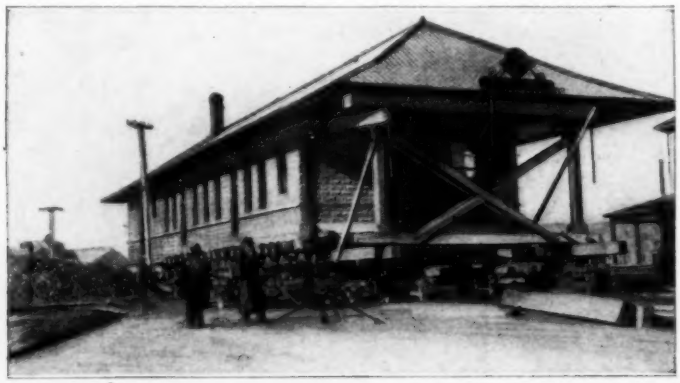
A substantial typewriter table of oak or steel, which can be knocked down or set up quickly without the use of a tool, is a new article of office furniture. When it is set up the legs are attached to the corners by means of bolts with wing nuts, while to pack the table into small space, these bolts are removed and the legs nested beneath the shallow drawer and sliding shelf which are provided just below the top. The table is 34 in. long and 26 in. high.



Collapsible Typewriter Table: It can be Knocked Down or Assembled as Shown, without the Use of a Tool

CONCRETE-BLOCK STATION MOVED WITHOUT INJURY

In connection with street improvements made in Corvallis, Ore., it became necessary to move the concrete-block railroad station to a site 1,000 ft. distant. The structure was jacked up, track and rollers were laid beneath it, and the transfer was made without causing a crack to appear in the walls. The station is 100 ft. long, 50 ft. wide, and weighs 200 tons.



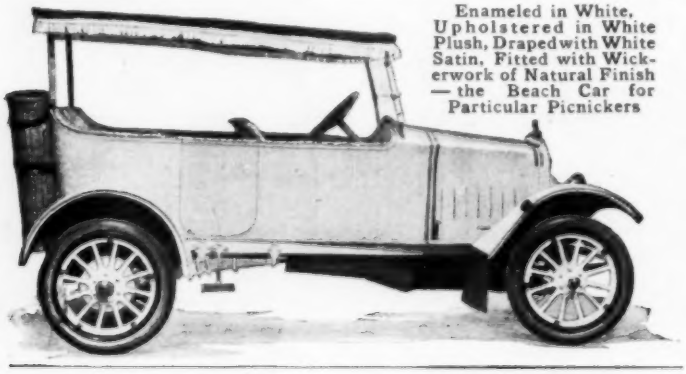
Moving the Corvallis, Oregon, Railway Station, Built of Concrete Blocks: The Task Occupied About Two Weeks and was Accomplished without Injury to the Building

NEW MATCH IS WATERPROOF AND WINDPROOF

An inventor, who is said to have once won a large prize from the Belgian government for inventing a nonphosphorous safety match, has recently developed a match which, he claims, is waterproof, windproof, and also foolproof. After tests made by United States authorities, orders have been placed for a quantity of these matches which will be especially serviceable in lighting signal rockets, certain types of bombs, and on shipboard in bad weather. Water does not harm them and in the face of a strong wind they will burn for five seconds at least. As soon as a blaze is extinguished the ash is cool, and the burned match can be thrown anywhere without danger of starting a fire. Because of this feature the new article is called foolproof.

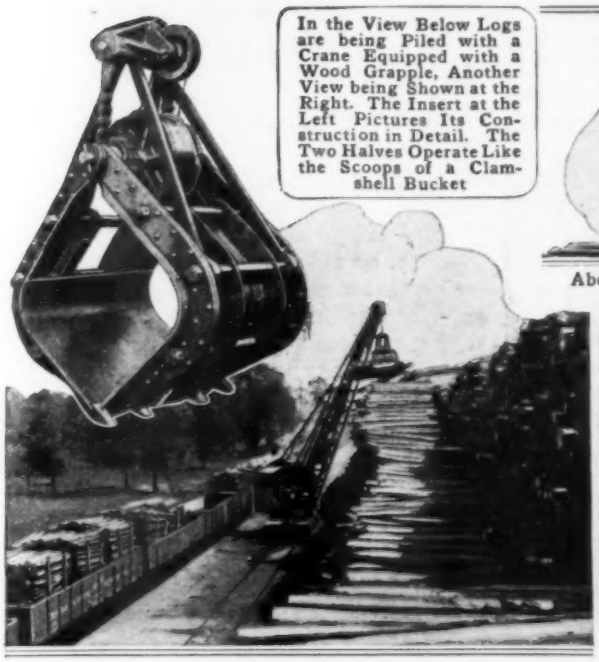
BEACH CAR BUILT TO MEET WHIMS OF THE FASTIDIOUS

There is now a car for nearly every occasion. The latest model to be added to the already long list of special vehicles is the beach car. It is designed particularly for folks who enjoy spending their summer afternoons in the surf and having their evening meal around a camp fire on the sands. The body is finished in white enamel with red trimming. The interior is of wicker and white-plush upholstering. Beside the driver's seat there is a hamper which is designed to hold wet bathing suits.



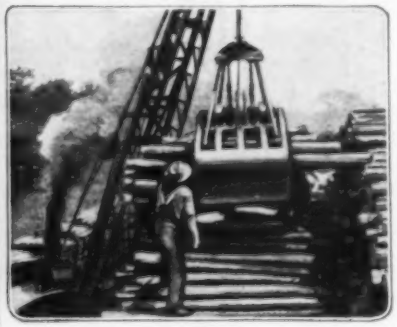
Enameled in White, Upholstered in White Plush, Draped with White Satin, Fitted with Wickerwork of Natural Finish — the Beach Car for Particular Picnickers

There is also a generous-sized compartment for lunch. At the rear a wicker receptacle for beach parasols is provided. The wicker top is draped with white satin. Fore doors are eliminated, as are the running boards. The car is a dainty little machine likely to satisfy the whims of most any maid of the surf.



In the View Below Logs are being Piled with a Crane Equipped with a Wood Grapple, Another View being Shown at the Right. The Insert at the Left Pictures Its Construction in Detail. The Two Halves Operate Like the Scoops of a Clamshell Bucket

Above: A Grapple Lifting a Load from a Freight Car



WOOD GRAPPLE SAVES WORK IN HANDLING LOGS

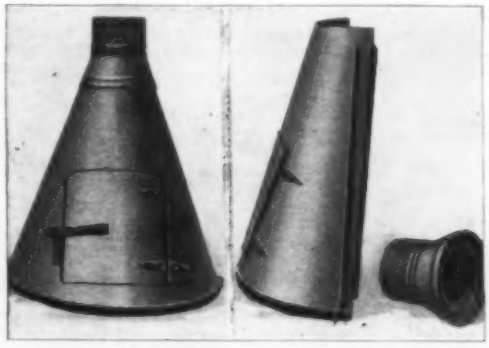
The handling of logs by means of a crane equipped with a wood grapple is not only more spectacular than the old method, but it effects an immense saving in labor and has made it possible to pile logs to a great height. Similar outfits are used in handling ties, posts, pulp wood, etc. The grapple is made like a clamshell bucket except that the scoops are replaced by curved steel tines, in the grasp of which a large number of logs can be held at once.

DISCOVER SUBSTITUTE FOR LYCOPODIUM

An interesting method is being employed to provide a substitute for lycopodium, the vegetable material formerly obtained from Russia for coating molds in foundries, to prevent sand from clinging to the castings. The substitute is the dust obtained from the gas discharges of drying apparatus in works where coal or lignite is briquetted, a centrifugal process being employed to precipitate it.

COLLAPSIBLE CAMP STOVE FOR FOREST GUARDIANS

Forest rangers in the West are beginning to use a new type of collapsible stove of their own invention. It is made in three parts that may be nested together compactly so as to be readily packed with other camp equipment for transportation. Except that it may be disassembled, the stove is similar to

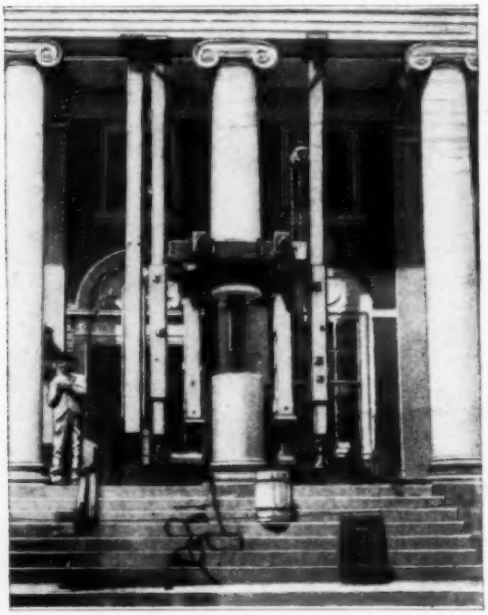


Two Views Showing the Stove Assembled for Use and Collapsed for Transportation

one that is well known to miners and others accustomed to "roughing it" in the West.

REPAIRING OF COLUMN A DIFFICULT TASK

Builders were confronted with an unusual problem recently when a drum in

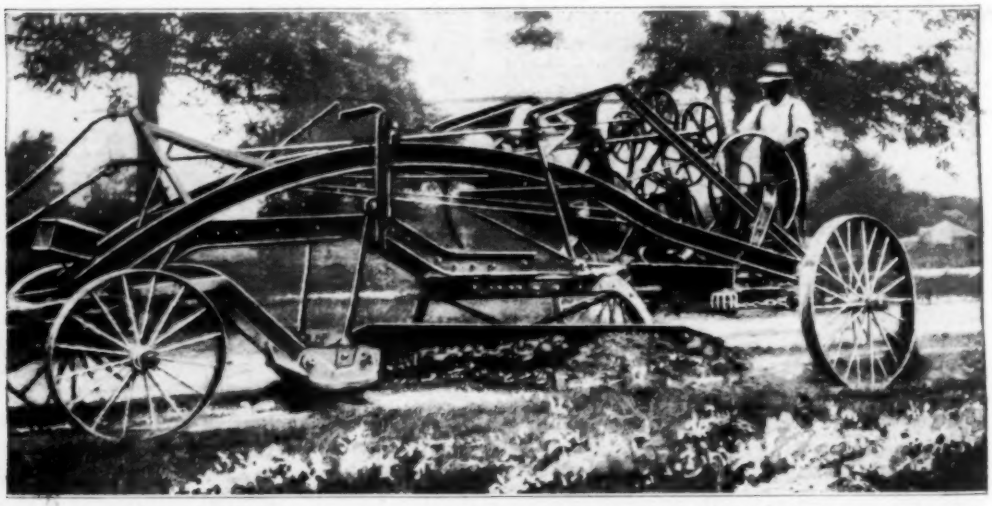


How the Stone Column was Held in Position While a Defective Drum was Replaced by a New One

a portico pillar adorning an eastern post office had to be removed because it was found to be defective. Rather than tear down the whole column it was decided to lift the weight off the pillar and hold its upper half in place while the imperfect part was removed. Jacks and beams placed vertically were used to take the weight of the roof from the pillar. To hold the upper half of the latter during the repair work, a wooden framework was clamped about it and supported by jacks. Workmen were then able to take out the defective drum after chipping away some stone and cement, and the dowel pins. This done, the task of placing the new section was easy.

NEW ROAD-MAKING MACHINE SCARIFIES AND GRADES

A new road-making machine combines the functions of a scarifier and a grader, making it possible to break up old and rotted macadam, or gravel, and level it off for the roller, in one operation. The scarifier, or rooter, is held in place just back of the front wheels by a diagonal arm and is provided with five teeth, set staggered, 10 in. apart, their ends being bent forward so that they easily enter and remain in the ground. The grader is suspended beneath the center of an arched steel frame and is controlled by an operator standing on a rear platform.



By Breaking Up Hard Old Macadam with the Rooter, Shown Just Back of the Front Wheels, and Leveling It Off with the Grader Blade, This New Machine Performs Two Functions at Once

UNSUNG HEROES

PART II - "THE BUZZER"

by E. T. Bronsdon

WHEN Resta, Chassagnes, De Palma, Rickenbacher, or another of the speedway kings tears around the tamarack for a new record in the ten miles, railbirds praise the wonderful motor and the daring driver. Nine out of ten lay critics talk in terms of "cubic-inches piston displacement" or "weight per horsepower." Rarely is a thought wasted upon the ignition system which held up perfectly, the magneto which delivered the hot spark through the wiring and plugs to the explosive mixture, or the wiring itself, which had to stand a buffeting similar to that a defeated prize fighter receives from his opponent. No, the spectacular features of any mechanism are always the ones praised.

In our present war machine there are many spectacular parts to excite wonder in the civilian and to win his praise because of exceptional performance. An army may be likened to a racing automobile. The driver, with his hands on the wheel and throttle, is the generalissimo, seated 10 or 15 miles back of the firing line, picking the course for his million-man-power machine. The cylinders and pistons represent the artillery, giving power to the advance. The transmission, making use of that power, is the infantry. The ignition system? This is the signal corps, members of which are familiarly known as "buzzers."

No matter how many giant cylinders a racing machine might have, no matter how perfect crankshaft, connecting rods, cams, or transmission, a single short circuit in the ignition system would transform the gallant car into imposing but useless junk. In a modern army system, cutting the lines of communication with headquarters for a single day often would mean utter rout instead of victory, and death to thousands instead of triumph. The buzzer is, perhaps, the most necessary cog in the whole machine, his work is more dangerous than an average of all the other active branches of warfare, and yet he is forgotten!

In the battle of Sunken Road, at the time of the Somme advance, the buzzer had one chance to show how desperately important his work is to an army attacking.

Bombers and infantry in three waves had occupied Sunken Road, that trenchlike artery which winds about the bloody battle ground of High Wood, connecting the towns of Bapaume and Albert. It was a position deemed extremely important, both by the English and the Germans—and therefore more than ordinarily hard to hold. It formed a diagonal wedge into an intricate system of Boche defenses, and by means of a system of traverses it gave access to the enemy trenches, but likewise gave him the same openings for counterattack.

Holding this strip of road, filled with poisonous gas almost at the enemy's pleasure, and enfiladed by machine-gun fire whenever the sandbag breastworks in the traverses were smashed in, had been thought impossible, but for tactical reasons which developed later, the terse command had been given the attackers: "Hold Sunken Road until relieved!"

For the same reason which prompted

this order, an extra squad of buzzers was sent over the top with the attackers. These had instructions not to wait for a consolidation of the position, and the building of communication trenches back, but to lay wires and set up two stations in Sunken Road immediately.

According to Serg. Sherman Lamarck of the Queen's Royal West Surrey Regiment, a survivor of this engagement, the first thing every man in the two buzzer squads did upon receiving this news, was to sit down and make a new will! Surely an excellent testimonial to the quiet life led by the "electric moles," as one Irish private called them.

After a terrific engagement in which 14 officers and over 200 men lost their lives, the Sunken Road objective was attained.

The moment the hand-to-hand fighting cleared sufficiently to allow it, the buzzer squads dug out niches in the mud walls, installed their instruments, and sent out Privates Lemm and Sennich with the reels.

The job of these two was unenviable. Back over the ground they had covered in the attack they went. At the back wall of the road trench they scrambled out, each pulling up after him a heavy wooden reel, in appearance much like the wheels seen yet on oxcarts in the Philippines and the less progressive portions of New England.

Each wheel was wound with 75 yd. of heavy wire, proofed against heat, and made to resist explosion better than ordinary copper cable. The two men, scrambling to their feet on the rim of the parados, seized the reels and swung them, much as a bowler swings a ball that is too heavy for him.

When released, the reels rolled a few yards out into No Man's Land, and tumbled into pockmarks made by the British barrage 20 minutes previously. On hands and knees, scuffling along the muddy, uneven terrain, came the two buzzers, following the uncoiled wire, which looped up in many places five or six inches from the ground as if dreading contact with the mud.

The wire layers had to pick ground where there was little or no "casual water"—as the golf player would say—for the purpose of avoiding "shorts." They then had to secure the wires in the positions selected by driving in wooden staples every eight or ten yards with a small hammer.

The operation was speedy, taking less time really than is required to describe it. Each time the reel was reached the wire layer fell into the shell hole beside it, and stayed quiet until the rain of bullets moderated a trifle. Then he raised himself to his knees, and aimed the reel at another shell hole farther on.

Forty yards were traversed by the two privates on this occasion before they attracted much attention from the enemy, who was busy organizing a counterattack upon Sunken Road. Then a machine gun opened up and the two became casualties. A pair, waiting behind in Sunken Road—and doubtless praying to be spared this opportunity of earning a Distinguished Service Medal—scurried out, bent over like men running through a heavy hailstorm, and took the vacant places. One of these had a different idea: He ran along, pushing his reel like a hoop, until he fell, less than 10 yards from the British parapet. His reel rolled up slowly and toppled over the edge.

The other won through unscathed through some miracle, although the right side of his legging on the left leg was torn away by bullets. He coolly finished up staking his comrade's wire also, and then made his way safely to the fire trench.

One more of the buzzers of the original groups lost his life half an hour later. A shell cut one of the wires only a few yards back of the parados. He hurried out and patched the damage. Apparently no enemy saw him, although by this time the light of dawn had made star shells unnecessary. Rising to return, however, he called out jokingly to his comrades in the trench, and at that moment had the crown of his head carried away by a sister shell of the one which had done the damage.

"One of these . . . ran along, pushing his reel like a hoop, until he fell, less than 10 yards from the British parapet."

The holding of Sunken Road took a heavy toll in lives of its defenders, but subsequent events justified the sacrifice. Two hours after the wires were laid the message from headquarters came in code saying that at dusk an attack in force would be made upon Dummy Ridge and High Wood, and directing the force of defenders at Sunken Road at this precise moment to begin a flanking movement to the left.

A series of sorties through the traverses that afternoon yielded one item of intense interest as information. German reserves were being massed back of Dummy Ridge in preparation for an attack upon the British lines!

The line laid by the buzzers at the cost of their lives carried back this information, and as a result the plan was altered. The defenders of Sunken Road were directed to try the flanking movement to the right instead of the left. This was done, and a later "delayed" attack was made upon the coveted Dummy Ridge and High Wood, which was not launched until the reserves had all been hurried to the other scene of conflict.

The result is history. An impending German attack was outguessed and overwhelmed by an attack really engineered by the defenders of Sunken Road, aided materially by the two slender wires and the despised electric moles! Six square miles of the precious Somme territory fell into British hands.

The reason for the name electric mole is not readily apparent from the foregoing. It has reference to the usual habits of the buzzer. While on duty in an established trench he is not unlike a mole, for he burrows in the deepest, safest cave or dugout to be found, and there lives, breathes, and buzzes in gloom that is more than nocturnal. The degree of safety of the dugouts used as signal stations is not for the safety of the man himself, however. Far from it! His apparatus is precious, so in this part of his work he is accorded certain advantages. Instances are not isolated, though, in which whole signal stations have been buried by German "whizz-bangs" (H. E. shells), or in which a sudden raid on the trenches by the enemy has

found the buzzer at his post until suffocated by the smoke bombs the Germans throw into the dugouts, so he cannot really be said to have a "cushy" job at best.

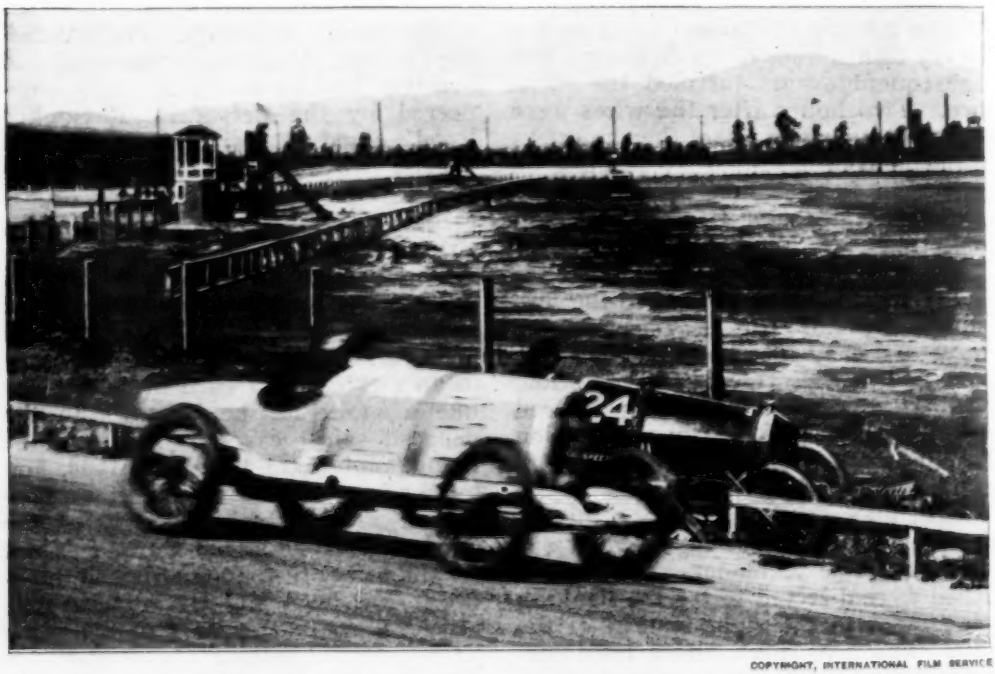
In his subterranean chamber he has control of both telegraph and telephone lines. In quiet trenches the latter is by far the most used, though while running wires back from advanced positions the telegraph is the rule.

For telephoning his terse and squeaky messages from one part of the line to another he uses abbreviations for nearly everything. These abbreviations, the development of work extending over many months, are understood by all operators, though to an outsider they would be worse than Sanscrit. Because the trench telephone has decided limitations in respect to the transmission of sound, the buzzer has evolved an alphabet which never was known before on sea or land. It is essentially phonetic, made for the pragmatic purpose of making different letters sound different one from another, and for that reason the following list may be misspelled, but it is near to correctness of sound:

ALPHABET OF THE BUZZERS

A—Akk!	J—Jay!	R—Arrrr!
B—Bear!	K—Kip!	S—Esses!
C—Cinch!	L—Ell!	T—Tap!
D—Don!	M—Emma!	U—You!
E—Eeee!	N—Nit!	V—Vic!
F—Efftt!	O—Oh!	W—Doubleyou!
G—Goo!	P—Pip!	X—Ecks!
H—Haitch!	Q—Kewp!	Y—Wy!
I—Eyey'eye! (Kiyi with the "K" left off)		
	Z—Zeff!	

The exclamation points are added merely to indicate the staccato manner in which each letter is delivered to the transmitter. In this code a ration party becomes known as "Arrrr! Pip!" the commanding officer as "Cinch! Oh!" while the medical officer gets a name that well might inspire some of our American popular-song writers. It is "Emma! Oh!"



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SPEEDING MOTOR TURNS TURTLE IN MIDST OF RACE

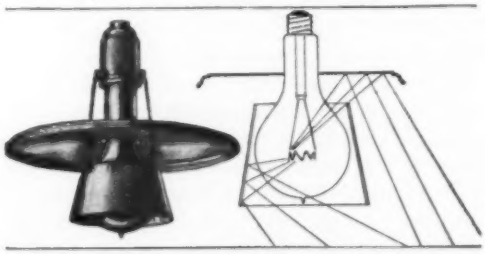
THOUSANDS of spectators of the Ascot Park races at Los Angeles recently were thrilled by an accident that happened to a French driver of an American entry. The mishap occurred on a turn after the machine, which was playing tag with an opponent, had flashed past the grand stand. Instead of holding to the track, it swerved, crashed through the fence into the infield, and rolled over two or three times. The driver was pinned beneath the car, but fortunately escaped serious injury. As the accompanying picture shows, the machine went through the fence just at the instant it was passed by one of its contestants.

AMERICA IS DEVELOPING BIG DYE INDUSTRY

How rapidly the United States is developing its own dye industry to meet the need keenly felt when German commerce was cut off in 1914 is clearly shown in statistics compiled by the Department of Commerce. Before the war German chemists led the world in making aniline dyes. Those manufactured in this country were valued at only $16,000,000. Since then American chemists have developed products said to equal those formerly imported, while $32,000,000 was the total value of the 1917 production.

FACTORY-LIGHTING UNIT FITS ANY SOCKET

A new, durably constructed lighting unit for industrial plants which can be attached to any socket is designed to diffuse a nonglaring light over a wide region. It consists of a flat circular reflector, below which is suspended a reflecting cone surrounding the bulb. These parts are of steel enameled with white porcelain. Only objects immediately below this fixture are lighted by direct rays.



A New Factory-Lighting Unit and a Diagram Showing Its Angles of Reflection

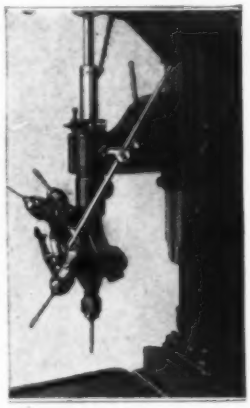
MOVABLE CANOE RACK FOR BOATHOUSE

A movable rack on which canoes can be stored is an invention of a boathouse superintendent. It is a decided convenience in moving the light craft to and from the water's edge. It consists of a frame mounted on four casters and having two uprights, to each of which three cross arms are attached. On these, six canoes can be placed upside down. A canvas canopy gives the necessary shelter.

Movable Canoe Rack: An Invention That has Proved a Great Convenience in Transporting Canoes to and from the Boathouse

DRILLING-MACHINE TURRET HEAD HAS FIVE SPINDLES

Convenient features are found in a five-spindle turret drill-head attachment that occupies about as much space lengthwise as an ordinary chuck. It may be applied to a single or multiple machine in a couple of minutes. Only the one spindle that is in working position revolves. By pressing a lever at the front, the turret may be turned in either direction. When tools of different sizes are being used on each piece of work in hand, the device economizes the operator's time.



PEAKS OF CARDBOARD SHOW CITY'S ELECTRIC LOADS

The miniature mountains of cardboard shown herewith are a graphic

Cardboard Display Showing Graphically the Electric Load of a City Every Hour in Each Day for One Year

representation of the electric loads of an eastern city for twelve months. Each day the consumption of electricity was plotted on a sheet of cardboard which was then cut out and added to the collection, making a "mountain range." The highest peaks were produced by the afternoon loads in December, and the valleys were created by the cessation of industry at noon and at night. Sundays and holidays are of course indicated by deep transverse depressions.

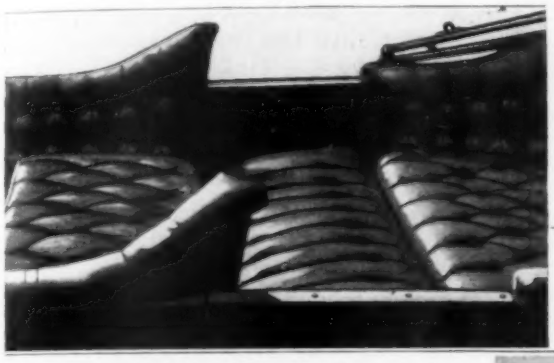
DECORATE AND FURNISH HOME WITH HEARTS

A most unusual home in the West has been very appropriately referred to as the "valentine of architecture," in such infinite variety have hearts been used as a motif in its decorations and furnishings. On a red heart-shaped sign hanging over the door is the name of the residence, "The Pericardium," the technical name for the casing about the heart. In the living room, the top of the table, the backs of the chairs and davenport, as well as sofa cushions, have the form of hearts. A similar design is stamped on the owner's silverware, and there are heart-shaped dishes, napkins, and napkin rings. In one chamber is a bed, the head and foot of which are composed of large hearts cut in wood. The same design is repeated again and again outdoors in the hedge, stepping stones, border stones, flower beds, and even in the varieties of flowers grown.

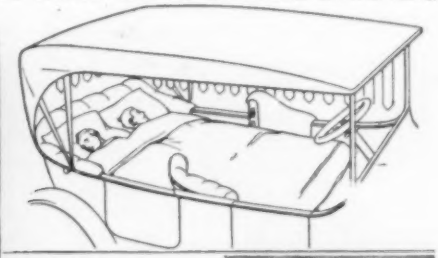
Left: A Chair and a Cushion Used in "The Pericardium". Right: The House of Hearts. This View Shows the Motif Repeated in the Hedge, Sign, and Garden Sticks

CONVENIENT MOTOR-CAR BED FORMED BY HINGED SEAT

One motorist who tours and believes in doing it in comfort, has solved the portable-bed problem in an exceedingly satisfactory way. The back of the front seat in his car has been hinged so that, when let down, it spans the space between the fore and rear-seat cushions, and with them forms a broad, inviting bed. One of the chief advantages of the scheme is that it obviates the need of burdening the car with extra paraphernalia at a time when space is needed for luggage and supplies. Best of all, it takes but a minute to make the change. With the top up and the side curtains in place, a tourist has greater privacy, a larger bed, and a better dressing room than the fellow who travels by rail.



This Is Larger and More Convenient Than a Pullman Bed and is Formed in a Moment's Time



With Top and Side Curtains in Place, the Motor Tourist Has a Splendid Sleeping Compartment

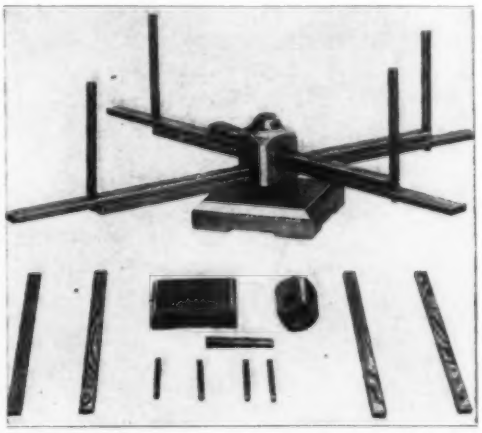
For Day Driving the Back is Raised and Locked Securely in Place, Leaving the Tonneau Unobstructed

FOR FIRST TIME STEEL IS MADE IN BRAZIL

What is said to be the first successful attempt at the production of steel from native pig iron on a commercial basis, in Brazil, was made not long since in a foundry a few miles from Rio de Janeiro. The converter used was of United States manufacture, and the steel is intended for the locomotive-repair shops with which the foundry is connected. For some years this plant has been turning out gray-iron castings weighing as much as 3,000 pounds.

KNOCKDOWN YARN REEL FOR KNITTERS

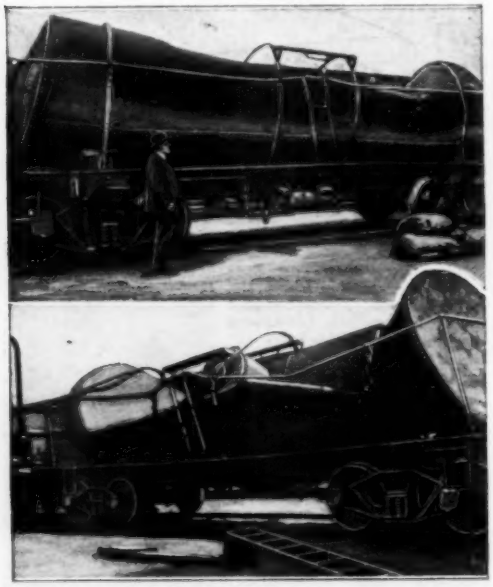
A yarn reel is now being manufactured which can be knocked down and packed into very small space for shipment. It consists of 11 parts, all wood, including a square base on which rests the hub. Two holes penetrate the latter at right angles and in them the arms of the reel are inserted.



The Simply Constructed Yarn Reel Ready for Use, and the Eleven Wooden Parts of the Reel, Which can be Packed into Small Space for Shipment or Storage

TANK CAR COLLAPSES AFTER CLEANING

An unusual accident illustrating the great force of atmospheric pressure occurred recently in the West after cleaning a tank car, preparatory to using it as a coconut-oil carrier. To remove all oil taint thoroughly, it was filled with steam and the heated residue was allowed to run out through a valve in the bottom. When the cleansing was finished the valve was closed, and soon after the tank collapsed as if it had been of cardboard. The obvious explanation is that when the steam cooled and condensed, a vacuum was created, and that the walls of the tank were not strong enough to withstand the pressure of the surrounding atmosphere.



Two Views of an 8,000-Gallon Tank Car Which Collapsed under Atmospheric Pressure after being Cleaned by Live Steam and Left with Air Inlets Closed

GREAT ICE JAM IS CAUSE OF SERIOUS FLOOD

When an ice gorge formed at the Fernbank Dam, below Cincinnati, some weeks ago, great damage was done to river property. Mountains of massive ice cakes jammed the Ohio River for days and caused a flood that proved serious to many neighboring towns on both the Kentucky and Ohio shore lines.

The Ice Gorge below Cincinnati Was a Magnificent Sight, but Also a Grave and Costly Misfortune. Tremendous and Many Interests Suffered Heavily. Towns on Both the Kentucky and Ohio Shore

ALL OF NIAGARA'S POWER NOW NEEDED, IS CLAIM

The controversy between those who would preserve Niagara Falls in their natural beauty and those who would utilize them for industry has been revived by the acute shortage of coal. An electrician of international reputation contends that sooner or later the fuel problem will force us to use the falls even to the extent of letting them run dry. But, according to the plan which he proposes, only 10 per cent of the water could be diverted on Sundays and holidays so that the public could enjoy the mighty cataract, at frequent intervals, as in the past. This arrangement would also make possible an entirely new and inspiring spectacle, for when the power generators were shut off one could watch the growth of the first tiny stream trickling over the precipice until it became a waterfall of vast dimensions. Since the falls are now under government control, their power could be developed not for private interests but solely for the public good.

The Damage to River Craft and Property Was Lines near Cincinnati were Affected

CUTTING FOUR AEROPLANE PROPELLERS AT ONCE

Speedy, large-quantity production of air craft has put a premium on labor

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The Black Pattern Propeller in the Center Acts as a Template and Guides the Four Cutting Tools

and time-saving methods in propeller making no less than in other work that is involved. It is interesting, therefore, to know that a machine that operates somewhat on the principle of the pantograph, enables one man to work on four propellers at a time. A fifth, or pattern propeller, acts as a template and guides the four cutting tools.

"BOMBPROOFS" A NECESSITY IN MINING OPERATIONS

A large mining company in the Southwest has found that the equivalent of bombproof shelters is quite as necessary in its business as in war. This concern is engaged in blasting away a mountain of copper, and some sort of protection is needed to shield the men from flying rocks. Several cylindrical shelters of $\frac{3}{16}$-in. steel have been set up at various points to serve this purpose. Not only do the workmen avoid danger in these structures

but it is unnecessary for them to walk beyond the range of flying fragments,

One of the Steel Shelters in Which Miners Take Refuge When Dynamite Blasts are Set Off

and so, much time is saved for the company.

BELL, SILENT FOR YEARS, TO RING IN NEW YORK

Arrangements have been made for hanging in the cupola of New York's city hall a bell which, though the property of the municipality for 25 years,

Bell Cast for the Former Village of Tremont, to be Hung in New York's City Hall Cupola After Being Silent for 25 Years

has not been rung in all that time. It was cast more than 40 years ago for the former village of Tremont, and when the territory including the village was annexed to New York, it became the city's property. It will be used to strike the hours and will be rung on special occasions. Because the hope has been expressed that one of its early uses will be to signalize the return of peace, some have called it "the peace bell."

ELECTRIC-STEAM WHISTLE AIDS LOGGING MEN

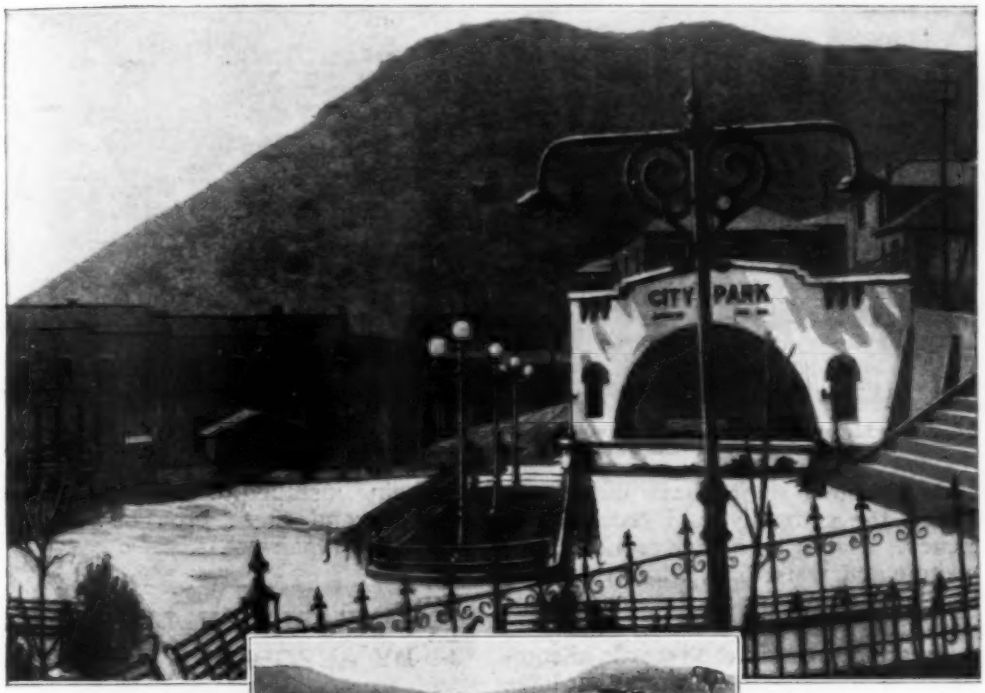
A new electrically controlled steam whistle, for skidders or similar engines, enables loggers to work to much better advantage than formerly when engaged in drawing logs to a central loading place. The valve for this whistle is controlled by an electromagnet supplied with current from dry batteries. Electric wires

Electric-Steam Whistle and Accessories with Which a Man Some Distance from the Engine can Signal the Engineer When to Snake Out a Log

are stretched back into the woods where the trees are being felled and at the proper time a button is pressed, causing the whistle to blow and informing the engineer and the entire crew that the log attached to the cable is ready to be snaked out.

¶The demand for ostrich feathers having fallen off, ostrich farmers are turning their attention to canning the large birds' eggs and selling them in this form for cooking purposes.

TOWN CARVES PARK SITE IN HILLSIDE

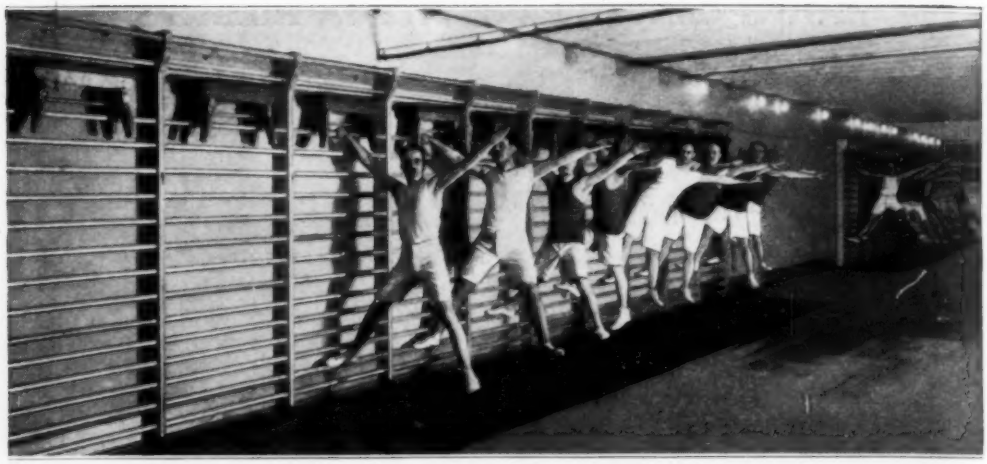


Top: A Portion of the Recreation Center, Showing the Band Stand and the Level Area Surrounded by Park Seats. On the Latter Dancing and Roller Skating Are Popular. Lower View: Park Pavilion from Street Level, Showing Stores Whose Rental Makes the Park Self-Supporting

Some time ago the people of Bisbee, Ariz., decided that they wanted a city park but they had no place for one because the town is located in two deep cañons, and all the level ground is required for one narrow street and adjoining buildings. The unusual difficulty was overcome by blasting away part of an adjoining hillside, making a level shelf one story above the street, and converting this into a plaza. Ornamental lights, flower beds, shrubbery, a concrete band stand and pavilion are features of the recreation center. The paved portion is popular with dancers and roller skaters. The park is made self-supporting by the rental from four stores located beneath the pavilion and on a level with the main street.

COMPANY PAYS EMPLOYES TO EXERCISE DAILY

For the past six months the office employes of a large manufacturing concern have been paid to exercise an hour a day. The company feels that the best possible physical condition of its men is so desirable that it has fitted up a gymnasium for them and placed an experienced physical instructor in charge. Executives, superintendents, managers, and others, are all urged to spend one hour of the company's time each day in the gymnasium. The re-

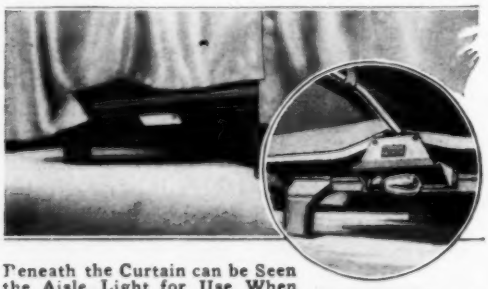


Office Men Employed by a Large Manufacturing Concern, Exercising in the Company's Gymnasium during Business Hours: The Firm has Found That This Systematic Recreation Pays

sults obtained so far have more than repaid the company in increased efficiency. Flabby men have reduced their weight and waist line, while thin men have put on flesh and developed their physique generally. These facts find interesting proof in the records of comparative muscular conditions that have been kept.

LAMPS UNDER SEATS LIGHT SLEEPING-CAR AISLES

After much experimenting to find the best way to illuminate the aisle of a sleeping car after the occupants have



Beneath the Curtain can be Seen the Aisle Light for Use When Passengers have Retired. The Insert Shows the Fixture with the Glass Removed

retired for the night, lights installed under alternate seat ends have been found most satisfactory. These are contained in reflectors having green-glass fronts and shed their subdued rays into the passageway from below the lower ends of the curtains. They are being installed on all new Pullman sleepers and those brought into the shops for repairs.

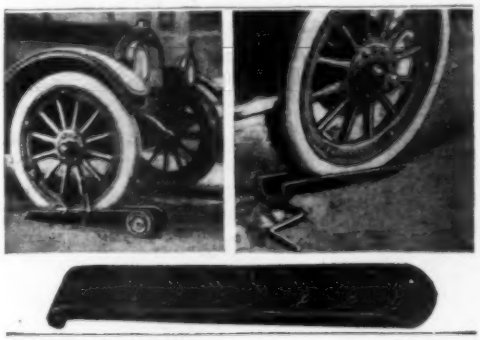
REMARKABLE BULLETS FIRED BY AEROPLANE RIFLES

Most persons have the impression that only ordinary ammunition is used in aeroplane rifles. The employment of light armor, the fact that a machine's gasoline tank is its most vulnerable spot, and the brief span of seconds that an enemy plane remains within range, all have contributed to the development of highly ingenious special missiles. Combinations have been made of armor-piercing and tracer bullets as well as of armor-piercing and incendiary projectiles. The last-mentioned contain an inflammable substance that is ignited when the cartridge is discharged. Its glowing spark explodes the fuel if the bullet cuts into the tank. The tracer projectile contains a material that burns with a brilliant light so that its trajectory is discernible day or night. Since he is thus made able to observe the path of the bullets, a gunner can correct his aim almost as easily as if he were holding a hose and directing a stream of water on a moving target. There has been difficulty in making ammunition of this sort because of the small caliber of the cartridges. The

War Department has announced, however, that the Ordnance Bureau has developed a class of special aeroplane bullets that are equal, if not superior to those at present used in Europe.

"CHAIN LADDER" HELPFUL FOR STALLED MOTORIST

Those motorists who have invoked the kind offices of a good-natured farmer and been pulled out of deep sand or mud will appreciate the convenience of a "chain ladder" intended to assist a car out of embarrassing predicaments. The device consists of a strong, pressed-steel channel, slightly wider than a tire, fitted with cross chains. When a machine is stalled,



Left: Fitted with Caster and Used as Auxiliary Wheel; Right: Pulling Out of a Hole; Below: The Device Itself

one of the devices is pushed down in the path of each of the rear wheels—unless only one of them spins. A car can then climb out of an ordinary hole without difficulty.

NEW LABORATORY TABLE HAS MANY CONVENIENCES

For the modern school laboratory a new type of chemistry table designed for a group of four pupils, meets many requirements. It has four lockers and 16 drawers, eight of the latter being immediately beneath the top, which extends at either end beyond the square base. This arrangement allows the stool, hinged at each corner, to be swung out of the way when not in use. The top, like the rest of the table, is of oak, but has a black acid-resisting finish. Immediately above the soapstone

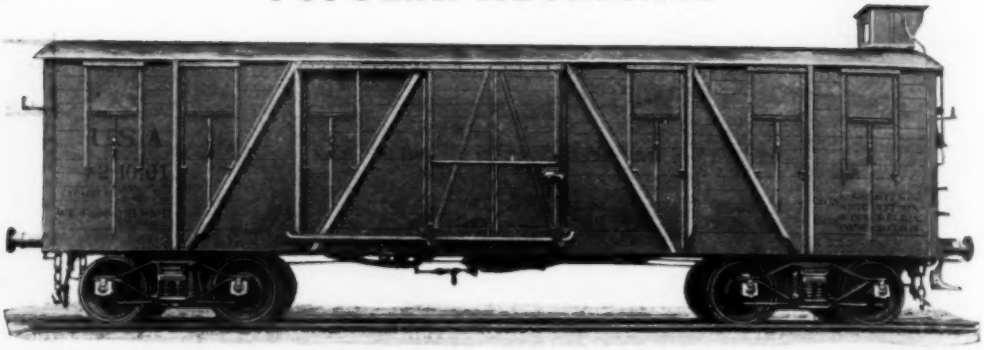
A Chemistry Table with 16 Drawers and Four Lockers: The Stools Are a Decided Convenience and can be Swung Out of the Way

sink is a metal fume hood connecting with a telescoping outlet pipe.

HOTEL MAN'S SIGN BOOSTS SALE OF THRIFT STAMPS

After having had but moderate success in disposing of thrift stamps, the management of a western hotel installed an electric sign that at once increased the sales greatly. The notice, which was placed above the cashier's window, read: "Will You Take Thrift Stamps for Your Small Change?"

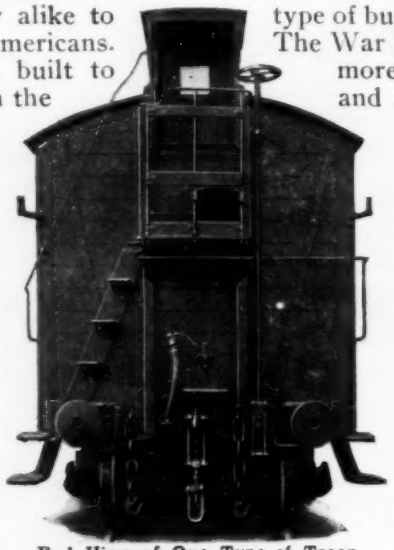
This Sign, above the Cashier's Window in a Western Hotel, Proved a Big Stimulus in the Sale of Thrift Stamps



An American-Made Troop Car for Use in France, Representing a Combination of American and Continental Standards

CARS FOR SAMMIES ABROAD HAVE NEW FEATURES

On the railway lines in France being operated by our soldiers and engineers is rolling stock having features that make it quite new alike to the French and the Americans. The cars, for example, built to carry troops to and from the front are a combination of Continental and American standards of box-car construction. The object has been to design a car that could be built rapidly, easily repaired, and readily interchanged with freight equipment on French lines. These cars have six windows on either side, for which substantial blinds are provided. One car out of a number of ten, or less, is provided with a sort of cupola at one end for the brakeman, which is reached by narrow steps projecting from the end. The Continental type of bumpers is also provided. The War Department has ordered more than 700 locomotives, and several thousand standard-gauge and narrow-gauge cars for the use of our troops on French soil. The cars shown herewith are 36 ft. long.



End View of One Type of Troop Car Having a Cupola Affording Shelter to the Trainman

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¶ The use of square gallon cans instead of round quart cans is being considered by canners, especially for sending supplies to Europe, because of the big saving in tin and the equally valuable saving of storage space that would result.

NEW RECRUIT IN LIMELIGHT AFTER TILT WITH U-BOAT

Chief Gunner's Mate Benjamin H. Groves, commanding officer of the armed guard aboard the merchantman "Nyanza," which was attacked at sea by a German submarine in the middle of last January, has been commended by Secretary Daniels for zeal and efficiency in the performance of duty. Early in the morning, Sunday, the thirteenth, a periscope was sighted 1,000 yards off the port beam and at the same time a torpedo was observed near at hand. The stern of the "Nyanza" was turned quickly to escape the missile and the after gun opened up on the U-boat. After falling far astern, the submarine came to the surface and gave chase, firing shrapnel with its two guns. An engagement ensued for about two and a half hours, during which time the mer-

chantman was hit in five places. A few minutes before the end of the fight, the gunners on both vessels got each other's range at about the same instant. The "Nyanza" let go four shells in quick succession. The submarine swung broadside, keeled over, and disappeared beneath the surface. Young Groves enlisted in the navy last November.

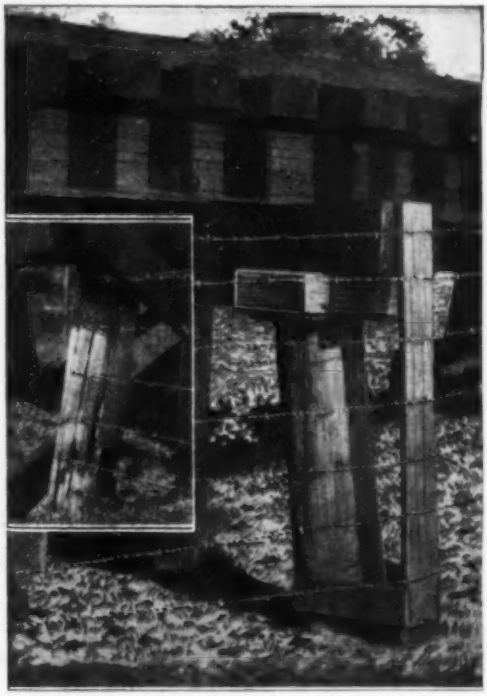
TESTS SHOW HOW CONCRETE ROADS SAVE HUGE SUMS

The surprising differences in the amount of power needed to haul loads on different kinds of roads were shown in tests made recently. The resistance to a truck's power offered by a dirt road was 99 lb. per ton, by a gravel road, 82 lb. per ton, and by concrete to which has been added some other surfacing material, 50 lb., while the best showing of all, namely 30 lb. per ton, was made on a smooth concrete highway to which no other surface material had been added.

Using as a standard a three-ton truck with a capacity load and a speed of 12 miles per hour on an unsurfaced concrete road, the truck, it is said, will make 7.2 miles per hour on surfaced concrete, 4.8 miles on gravel roads, and 3.6 miles on dirt roads. It is estimated that if all the highways traveled by the 400,000 motor trucks in America were concrete, the annual saving in their operation would be over $237,000,000 per year as compared with the cost of operating them on dirt roads.

SALT BATHS PREVENT DECAY OF UNPRESERVED PILING

Rock salt is being used in an interesting manner to preserve uncreosoted wooden piles supporting low railway trestles. A shallow, open-top box is built around the head of each pile and fitted loosely. They are then filled with rock salt. Occasional rains supply the receptacles with water. The strong saline solution thus formed seeps from the boxes and covers the piling. In this way the timbers are automatically treated at frequent in-

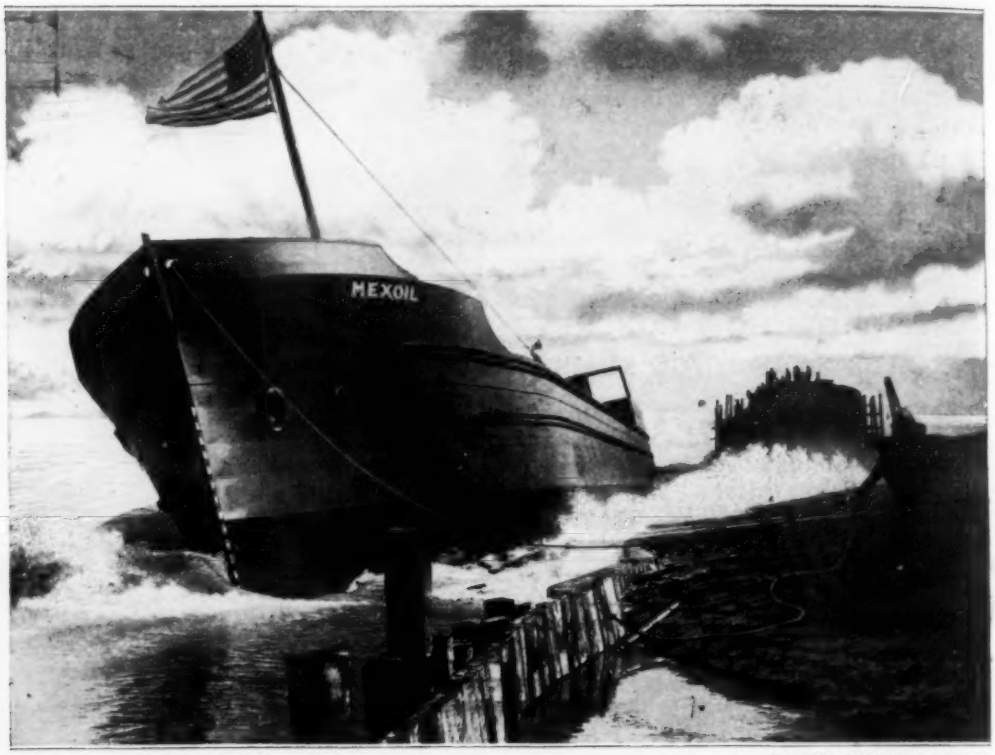


A Box is Built around the Head of Each Pile and Filled with Rock Salt. The Insert Shows What Happens When This is Not Done

tervals and their decay is prevented, or at least, considerably delayed.

FOLDING SAFETY GUARD FOR WINDOW WASHERS

To take the place of the belt-and-rope harness usually worn by window washers employed on high buildings, a folding safety outfit has been devised consisting of a platform with a curved guard covered with wire netting extending around three sides. It is held securely in place on the outer window sill by clamps extending inside the building.



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TANKER IS FIRST STEEL SHIP BUILT SOUTH OF NEWPORT NEWS

SEVERAL weeks ago the "Mexoil," undoubtedly the first steel ocean-going vessel so far constructed south of Newport News, was launched at Violet, La., 12 miles from New Orleans. The ship is one of a fleet of four tankers being built for transporting crude oil from the Mexican fields to Atlantic ports. It is 246.5 ft. in length, 36 ft. of beam, and 19 ft. in draft when loaded. Its capacity is 16,000 bbl. and its cost approximately $400,000. Its sister ships will be of the same dimensions. The boat mounts two turbo-generator motors of 350 hp. each, which will turn twin propellers and produce a speed of 11½ miles an hour. Steam will be provided by two Scotch marine boilers. The photograph reproduced above shows the vessel gliding sidewise from its ways into the water.

POWER-DRIVEN DRAG SAW DOES MANY MEN'S WORK

A drag saw, driven by a portable 4-hp. gasoline engine, has been placed on the market which can cut logs several times faster than two men working by hand. The saw has a 20-in. stroke and 1 gal. of gasoline is used in cutting 10 cords of wood. The engine is mounted on a V-shaped frame and is connected by a chain with a wheel and crank that imparts the desired motion to the blade. The pointed end of the frame is intended to lie on the ground while the other end rests on the log and is held securely in place by two hooks driven into the latter. The outfit weighs 285 lb., including water and gasoline for the engine.

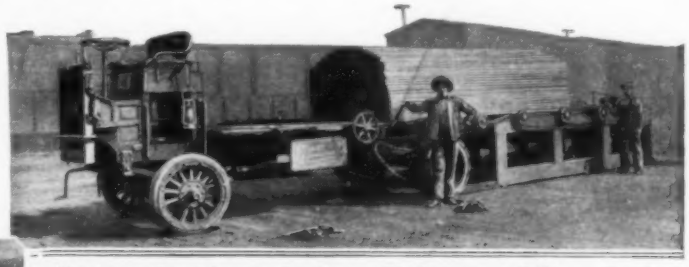
Power-Driven Drag-Saw Outfit That Weighs 285 Pounds, Including Water and Gasoline: Its Capacity Is 25 to 40 Cords of Wood a Day

DOUBLE WATER SYSTEM PROPOSED FOR CITIES

To solve the problem that congested population centers are facing in obtaining adequate supplies of wholesome water, a waterworks superintendent proposes a dual waterworks system, which would consist of one set of pipes for drinking and cooking water, and another set to carry inferior water for manufacturing, fire protection, sewer flushing, street sprinkling, etc. It is admitted that it would cost more to lay two systems of mains than one, but it is pointed out that possible savings would compensate for this, in part at least. Now a whole water system has to be constructed so that high pressure for fires can be obtained and provision has to be made to keep all water pure enough for domestic use. Under the dual plan the special requirements of each system could probably be met at less cost than it takes now to meet them. Whether the saving would offset the added expense would largely depend on local conditions governing the location of reservoirs, the natural water supply, and the need of purifying plants.

LOADING EQUIPMENT BOOSTS USEFULNESS OF TRUCK

Saving of time and reduction of labor are two of the results attained by a certain lumber firm by equipping its trucks, yard wagons, and stacking platforms with special loading apparatus. The actual working capacity of delivery machines has almost been doubled. An entire load is moved into place on a truck, or discharged from it, in three or four minutes. The apparatus consists of a series of horizontal rollers supplied at their ends with gears, which are connected by chains. Operation of a hand crank re-



Moving a Load from a Stationary Platform to a Delivery Truck, an Operation That Requires Only Three or Four Minutes

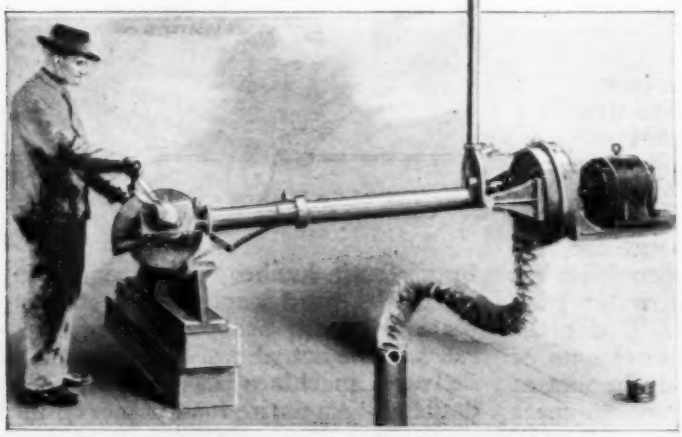
Transferring Lumber from a Yard Wagon to a Truck, an Effective Way of Saving the Big Machine's Valuable Time

Close-Up View of the Platform and the Rollers That Constitute the Loading Equipment

volves the rollers and moves the lumber that is piled upon them. Thus a load may be transferred quickly from a yard wagon or platform to a truck, so that the latter is idle only a few minutes while receiving or dumping its cargo. In discharging, a chain is bound about one end of the pile, which is moved rearward on the truck until it reaches the balancing point. Then the driver starts the machine suddenly and the load is dropped to the ground without spreading or scattering.

FAN DRAWS OFF ALL DUST FROM SWINGING GRINDER

A machinist has recently been granted a patent for a swing-frame grinder which is provided with a fan that draws off the dust produced by grinding, thereby greatly improving working conditions for the operator. At one end of a long hollow arm the grinding wheel is attached, while at the other is an inclosed steel-blade fan which is operated by a motor mounted directly in line with the fan's axle. Through two sets of gearing and a shaft the motor also drives the grinding wheel. The fan end of the hollow arm is supported by a pivoted rod hung from the ceiling. All dust is drawn off through the hollow arm and discharged into a hose.



Swing-Frame Grinder with Which a Fan has been Combined to Draw Off the Dust through the Hollow Arm: The Dust is Discharged into the Fabric Hose

STANDARDIZATION OF MEN'S CLOTHING IN BRITAIN

Standardization of men's clothing for civilians is one of the significant economical steps that has been taken in Great Britain. Rapid progress is reported in the manufacture of standard cloth, which is to be distributed among makers of ready-to-wear garments. Twenty-four patterns in coarse-wool cheviot, more durable than smart, are being produced for immediate use. It is expected also that about a dozen other patterns woven of Saxony wool will be added to the list. The standardization of worsteds is to be considered within a short time. About 2,000,000 yards of the cheviot have been ordered, and some 1,000,000 yards of the Saxony fabric will be made if the plan is carried out. There is a strong intimation that the scheme of standardizing clothing will soon include certain classes of apparel for women and be quite generally broadened in its scope.

HOGS ARE TO GET GARBAGE OF THREE MORE CITIES

The city of Denver's method of disposing of its garbage by way of a hog ranch, as described in Popular Mechanics Magazine recently, is being copied by other cities, one of the largest being Minneapolis. Hereafter that city will receive $1.26 per ton for garbage delivered to a central station instead of having to haul it to an incinerator and burn it. The refuse will be fed to hogs. Under a similar plan Harrisburg, Pa., will dispose of its garbage for $2,000 per month. South Bend, Ind., has entered into a 10-year contract whereby it will receive $1 per ton for garbage delivered to a central point.

Residences Built in One of the Substantial Districts of Newport News by the Shipyard for Some of Its Workmen and Their Families. A Day after Completion All of the Houses were Occupied

WHOLE NEW TOWNS TO HOUSE SHIPBUILDERS

THERE are many ways right now of "strafing" the Hun, and one of them is the double-quick erection of houses adjacent to our great shipbuilding yards. Thousands of men of all classes and types have been drawn from the four corners of the country to the east, west, and gulf coasts where wooden, steel, and concrete vessels are being fabricated. Tens of thousands more are needed. But first there must be places for them and their families to live.

A few months ago Newport News, Va., was a town of about 30,000 inhabitants. Today its population exceeds 60,000. This flood tide caught the city wholly unprepared. Rents aeroplaned skyward. In some instances as much as $85 a month was extorted for three small, unfurnished, unheated, third-story, or attic, rooms. Squalid hovels brought staggering prices.

To meet the situation barracks were erected for unmarried workmen. Then more barracks were built, some reserved for negro laborers. A large group of dwellings was provided in an outlying section. Comfortable residences were also built in the best districts and sold on a part-payment plan to employes. Still conditions remained unameliorated. The matter was carried to the Shipping Board, and a million and a half dollars set aside for the erection of 500 additional houses on

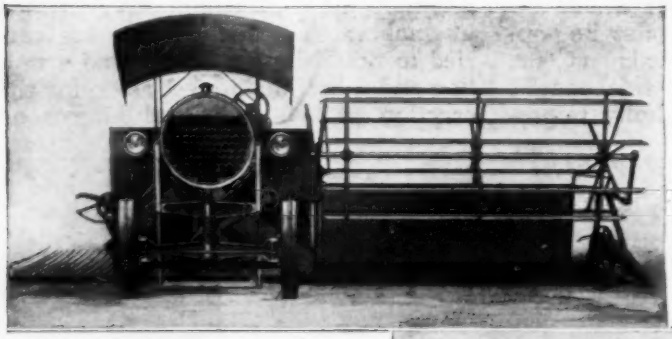
This Picture, Taken during Construction, Shows the Type of Barracks Built at Newport News to House Several Hundred Unmarried Employes of the Shipbuilding Company

land purchased along one bank of the historic James River by the local shipbuilding company. There a town is now in the course of construction. Workmen who occupy the houses will be given chances to buy them by making moderate monthly installments without interest. Furthermore, steps have been taken to prevent profiteering by private owners. When employes of the shipyard are charged exorbitant rents, the Shipping Board will have the power to commandeer the property.

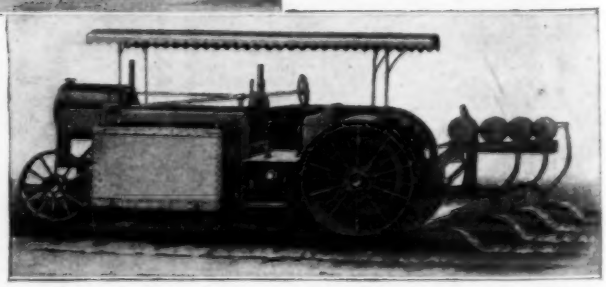
Another model industrial town is being built by the Shipping Board near Bristol, Pa., for some 3,000 workers and their families. Only a few months ago the site of the scores of houses, apartments, and business buildings now springing up, was farmland. The town is situated in a flat, slightly wooded area, and has been divided into city squares of 350 by 650 ft. Curved streets at the ends and diagonal ones in the central part of the area break the straight lines of the layout. In the middle of the townsite, generous space has been left for a public park and playground. The arrangement is such that no house is more than a 10 minutes' walk from the entrance of the shipyard. The town is divided into sections. Barracks and restaurants for unmarried workers occupy one of these; apartments for small families fill another district; group dwellings are situated in a third zone, and separate residences in still another. Along the main streets there will be stores with apartments above. Theaters, churches, and schools are also to be established.

FARM IMPLEMENTS INTEGRAL WITH TRACTOR WHEN USED

Among the new farm tractors there is one so arranged that implements used with it are essentially integral parts of the machine when in place. The engine is mounted rearward and the fore part of the frame shaped like an inverted "U." This permits a steel box with hinged ends and double-wagon capacity to be underslung. By removing the latter a specially built binder may be coupled in position. The operation of the cutting knives is independent of that of the tractor so that their speed may be increased, and the progress of the machine retarded, when fallen or heavy grain is encountered. In using a four-bottom plow, attached at the rear, the wheelbase of the tractor may be shortened, to permit easy turning, by telescoping the bridge frame. The engine's power may also be used to lift any or all of the plows. Permanent jacks raise the heavy attachments from the ground and facilitate the work of fitting them in place when they are to be used.

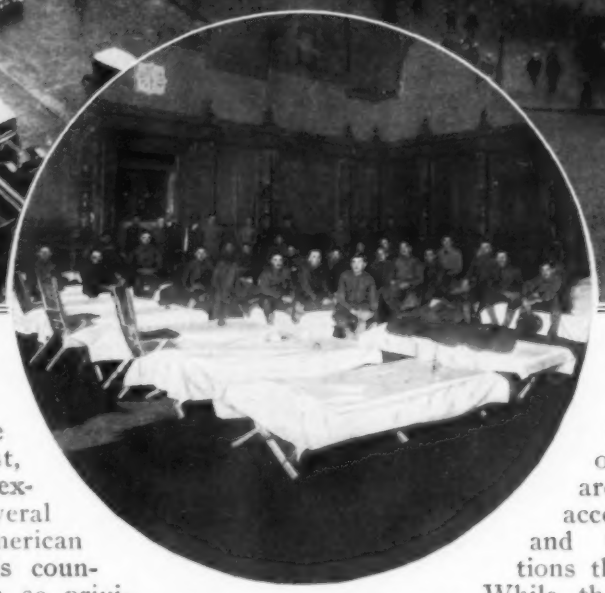


Showing the Tractor with the Binder Coupled in Place Ready for Use in the Field



With a Four-Bottom Plow at the Rear and the Steel Box Hung beneath the Frame in Front

PHILADELPHIA'S CITY HALL IS SOLDIERS' DORMITORY



Above: Army Trucks Parked in Philadelphia City Hall Plaza and Guarded by Police While the Drivers Sleep in the Costly Building. Below: Soldier Truck Drivers and the Cots Provided for Them in the Luxurious Finance Committee Room

Dwelling in richly decorated "marble halls," for one night at least, has been the experience of several hundred American soldiers in this country. The men so privileged are those driving new army motor trucks from the point of manufacture to Atlantic ports. It is while passing through Philadelphia that they enjoy such luxurious surroundings, for the city has generously offered them the finest accommodations it possesses, namely its famous city hall. The soldiers are made at home in the city council's rooms and committee rooms —apartments finished in white marble, mahogany, and gold, and richly carpeted. The men find their inviting cots all ready for them in these wonderful chambers, with fruit and sweets laid out for each one. Often they are too tired to accept the dinner and theater invitations that await them. While they are resting, their trucks are kept in the city-hall plaza under police guard. These army conveyances have been traveling in fleets of from 25 to 100, each machine carrying three or four men.

¶Arrangements have been made by the postmasters of Chicago and St. Louis which make practically certain the establishment of an aeroplane mail route between those two cities. Matter carried by the government's postal fliers will be charged for at a special rate, in all probability.

WORLD'S SEA LOSSES TOLD BY BRITISH ADMIRALTY

According to the official figures of the British Admiralty, recently made public for the first time, Germany's U-boats, sea raiders, and the elements have accounted for 11,827,572 gross tons of allied and neutral shipping during the three and a half years of war ended Dec. 31, 1917. Of this huge total, 7,079,492 tons represent the loss sustained by Great Britain. Following the declaration of unrestricted submarine warfare on Jan. 31, 1917, the quarter comprising the months of April, May, and June was the most disastrous. During that period, 1,361,870 tons of British, and 870,064 tons of foreign, shipping were sunk.

The world's net loss, considered apart from that of the central powers, of course, amounts to 2,632,297 tons. New ships launched in the United Kingdom since the outbreak of hostilities total 3,031,555 tons, while those built by other countries, aside from the enemy, bring the figure to 6,606,275 tons.

Enemy vessels, to the extent of 2,589,000 tons, have been captured and brought into service. This tonnage, added to that constructed during the war, makes a total of 9,195,275.

Three kinds of tonnage are recognized in marine practice: gross tonnage, net or registered tonnage, and dead-weight, or carrying-capacity tonnage. Gross tonnage is a measurement of all the space within a ship's hull and is computed on a basis of 100 cu. ft. per ton. When a vessel's tonnage is mentioned, but its kind not specified, gross tonnage is understood. It conveys an idea of a boat's size, irrespective of design.

Net registered tonnage is figured on the same ratio as gross tonnage, but refers to cargo space and is used as a basis for taxation. Dead-weight, or carrying capacity, cannot be accurately measured and is not given in marine registers. It means exactly what it implies and is usually calculated by allowing 40 cu. ft. of cargo space per long ton. Thus, the carrying capacity of a boat is roughly considered to be two and a half times its net registered tonnage. In this, however, the type of vessel must be considered.

In the case of steamers built solely for carrying cargo, the net is about 80 per cent of the gross tonnage and the dead-weight capacity two and a half times as great. With passenger ships, however, the net amounts only to about 25 per cent of the gross. In sailing vessels most of the space holds cargo, so here again conditions differ. Such a craft

	LOSSES BY ENEMY'S ACTION AND MARINE RISK			OUTPUT		
	Gross tons			Gross tons		
	United Kingdom.	Foreign.	World total.	United Kingdom.	Foreign.	World total.
1914—						
August and September	314,000	85,947	399,947	*675,610	*337,310	*1,012,920
Fourth quarter	154,728	126,688	281,416	.....	.....	.....
1915—						
First quarter	215,905	104,542	320,447	266,267	.....	.....
Second quarter	223,676	156,743	380,419	146,870	.....	.....
Third quarter	356,659	172,822	529,481	145,070	.....	.....
Fourth quarter	307,139	187,234	494,373	92,712	551,081	1,202,000
1916—					(Whole year)	
First quarter	325,237	198,958	524,195	95,566	.....	.....
Second quarter	270,690	251,599	522,289	167,693	.....	.....
Third quarter	284,358	307,681	592,039	124,961	.....	.....
Fourth quarter	617,563	541,780	1,159,343	213,332	1,146,448	1,388,000
1917—					(Whole year)	
First quarter	911,840	707,533	1,619,373	246,239	282,200	528,439
Second quarter	1,361,870	870,064	2,236,934	249,311	377,100	626,440
Third quarter	952,938	541,535	1,494,473	248,283	308,170	616,453
Fourth quarter	782,889	489,954	1,272,843	419,621	512,402	932,023
Totals	7,079,492	4,748,080	11,827,572	3,031,555	3,574,720	6,606,275
Enemy's vessels captured and brought into service of allies						**2,589,000
Net loss						2,632,297

* Whole year. ** Of this total more than 1,000,000 tons was taken at the outbreak of the war.
Note—Figures for gross tonnage of world's tonnage for August and September, 1914, include 182,829 gross tons interned in enemy ports.

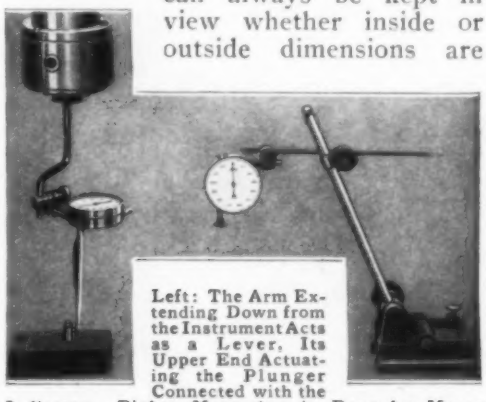
of 1,500 gross tons, for instance, would be about 1,400 tons net, and carry about 2,800 tons of cargo. These statements all apply to ocean vessels, for dead-weight tonnage differs in salt and fresh waters.

SELF-LOADING TRUCK HAS DEMOUNTABLE BODY

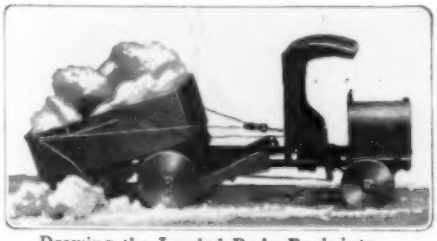
Rapid loading of large motor trucks used in hauling coal, snow, and the like, by one man is the object sought in designing a new type of truck body. It is mounted on four wheels set on a track that forms a part of the chassis frame and projects at the back end in a downward curve. By means of gearing and cables the body can be drawn backward and deposited on the ground. After the end gate has been let down the body is thrust into the coal or other material to be loaded, by backing the truck, thereby filling it very quickly. In case heavy barrels are to be handled one man can place them in the body without any lifting. When all is ready the body is drawn back onto the chassis. If desired, several detachable bodies can be carried by one truck in turn, thereby saving much time in loading and unloading.

MEASURING INSTRUMENT FOR MACHINE WORK

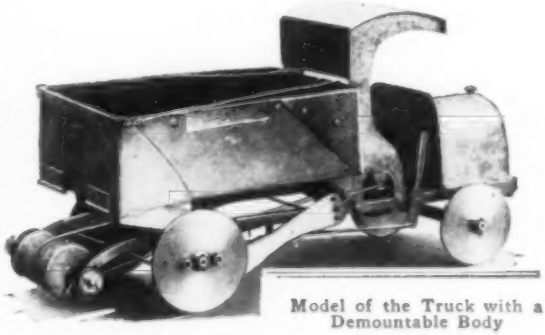
With a new measuring instrument for machine work, etc., the indicator can always be kept in view whether inside or outside dimensions are being ascertained. One face of the instrument's cylindrical case consists of a movable dial on which are 130 graduations representing .001 in. each. A plunger projecting from the side actuates the indicator. After the dial has been set at zero any subsequent movement of the plunger is shown in terms of thousandths of an inch on the dial.



Left: The Arm Extending Down from the Instrument Acts as a Lever, Its Upper End Actuating the Plunger Connected with the Indicator. Right: Measuring is Done by Means of the Plunger, Here in a Vertical Position



Drawing the Loaded Body Back into Position on the Chassis

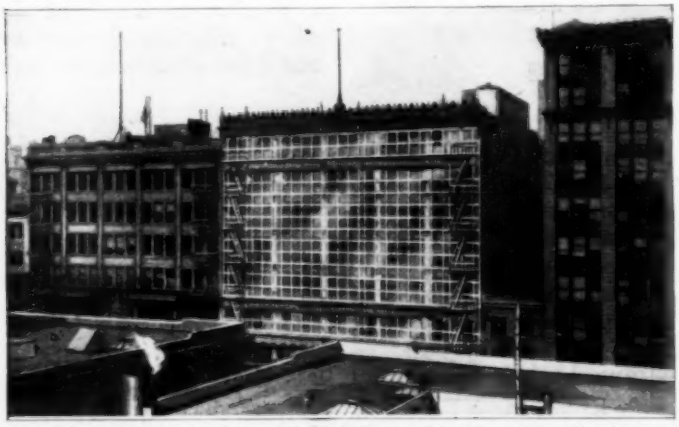


Model of the Truck with a Demountable Body

Loading the Demounted Body by Backing the Truck and Body into the Snow

FRONT OF OFFICE BLOCK ENTIRELY OF GLASS

Because sunlight is now recognized as an asset in a business office an office building is being erected in San Francisco the south front of which is all glass, the big panes in each case extending from floor to ceiling. In some lights the whole front looks like a huge mirror.



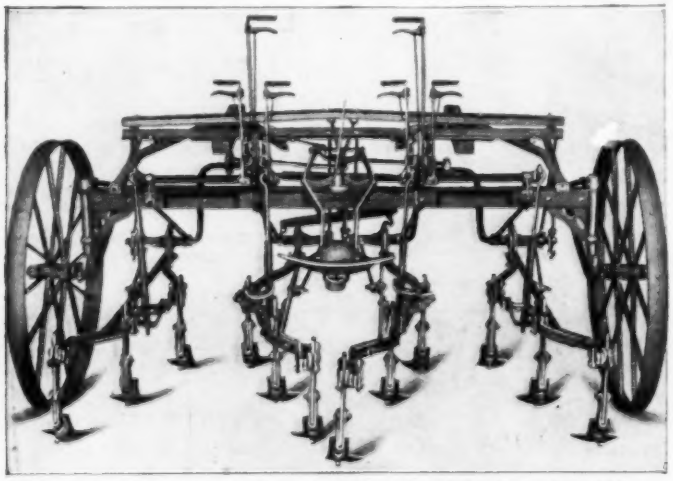
An Office Building with an All-Glass Front That Permits a Maximum of Daylight to Enter Each Floor, Thereby Lessening the Amount of Electricity Used by the Tenants

FLOATING AMBULANCES FOR BADLY WOUNDED

The advantages of using floating army ambulances wherever waterways are available back of the front are brought out in a report recently issued in England. Transportation by water of the severely wounded is especially desirable, for it does not subject them to jolts and jars that cause the most terrible suffering and often prevent recovery. It is most desirable to use craft which have little or no vibration and for this reason power boats towing barges rather than self-propelled boats are sometimes employed. In the case of one floating ambulance operating in a Belgian canal within about two miles of the front, 52 per cent of the severely wounded who were carried recovered.

NOVEL CONTROL IS FEATURE OF RIDING CULTIVATOR

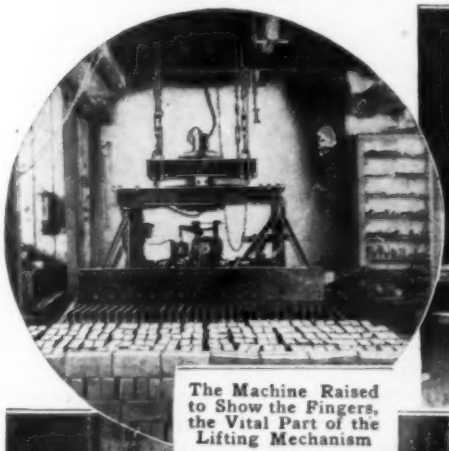
Seat control is the characteristic of a ball-bearing two-row cultivator that has made its appearance. The operator has only to rock his body to one side or the other in order to angle the wheels, swing the beams and frame laterally, and effect a quick shift when dodging a hill of corn that is out of line. The beams are attached rigidly to the front pendulum arch, and connected with the forward end of the seat bar. An extension of the latter casting also joins a cross bracket that connects the pivotal axle spindles.



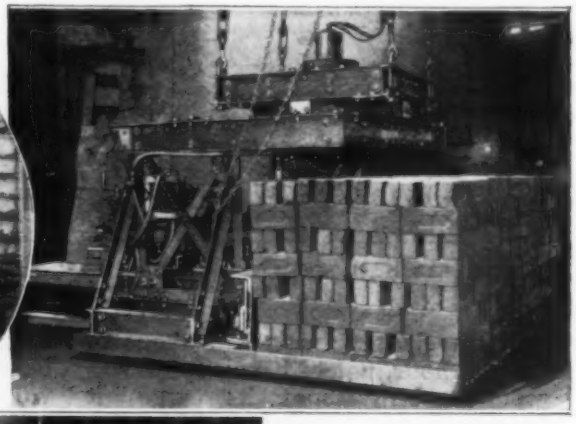
With This Cultivator the Operator Moves His Weight to One Side or the Other to Effect a Quick Shift

¶A new material for making a fine grade of paper, it is said, has been found recently in the form of tops from Zacaton grass.

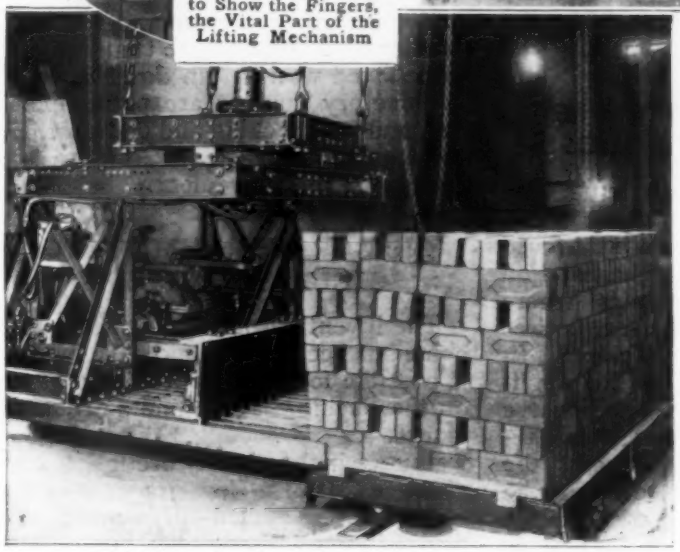
FLEXIBLE APPARATUS BUILT FOR "SETTING" BRICKS



The Machine Raised to Show the Fingers, the Vital Part of the Lifting Mechanism



Ready to Remove a Stack from a Drier Car: The Fingers have Yet to be Thrust between the Bottom Courses of the Bricks

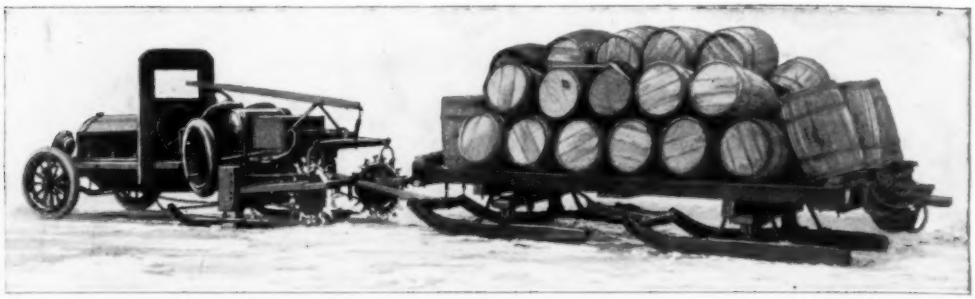


The Bricks have been Picked Up by the "Setting" Machine and the Drier Car Removed. The Unit Is Ready to be Moved into the Kiln

Long-standing difficulty in obtaining labor for "setting" bricks during their manufacture has led to the development of a new machine for doing the work, which is understood to have considerable flexibility. It operates in conjunction with an overhead crane. Satisfactory performance is not contingent upon the bricks being thoroughly dried. If they are able to stand up as they pass through the drier, it is said the apparatus will handle them without trouble. The lifting mechanism is provided with a series of long fingers, each of which is shaped like an inverted "T." These members are thrust between the bottom courses when, for instance, a stack is to be transferred from a drier car to a kiln. One model of the machine is designed to handle 960 bricks, 9 by 4 by 2½ in. in size, at a time. Other models have different capacities.

FAST SLEIGH TRAIN USED ON FROZEN BAY

When severe cold weather caused Green Bay to freeze from shore to shore, suspending shipping between Washington Island, Wis., and Menominee, Mich., one company transported several thousand barrels of fish across the ice in order to make its deliveries. To do this, a motor car equipped with runners and spiked driving wheels was used as a tractor for two large sleighs of 17,500-lb. combined capacity. The 40-mile trip was made twice daily. When loaded, the



Test Load of 42 Barrels of Salt Fish Coupled to Ice Car for Trial Trip: Subsequently the Front Wheels of the Machine were Replaced with Runners

outfit traveled at a speed of about 20 miles an hour, unless heavy snow was encountered. Without its cargo, it easily operated at from 25 to 30 miles an hour.

INNER-TUBE DEFLATOR MADE FOR TIRE-REPAIR SHOPS

Air is expelled from an inner tube in a few seconds by a deflating device lately introduced for installation in shops where motor-car tires are repaired. In using the appliance the valve plunger is removed, and the part of the tube opposite the valve stem is placed between a pair of spindles. By turning a crank which revolves the latter, the tube is rolled tightly.

TO ENROLL WOMEN WORKERS FOR NEW ENGLAND FARMS

A systematic effort to enlist women in farm work is to be tried out in New England where the prevalence of small farms largely duplicates conditions under which England has followed a similar plan with success. Women in groups of 10 to 70 will live in rural camps, or vacant farmhouses, under the care of matrons, and will hire out to farmers in the vicinity. Preparatory training of two or three weeks will be required of each woman before she will be allowed to work for a wage. This will give her the necessary training and physical preparation to make her serviceable. Among the tasks which it is believed women can do in a wholly satisfactory manner are potato planting, and fruit picking and packing. The Woman's Land Army of America is in charge of the movement.

NUT-CRACKING MACHINE HELPS SAVE CULLS

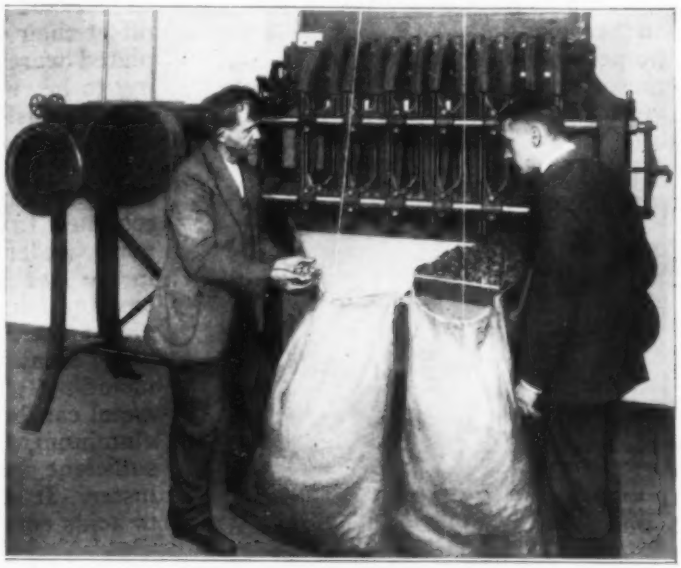
The invention of a nut-cracking machine has been a large factor in making it possible for English-walnut growers on the Pacific coast to find a profitable market for 1,500,000 lb. per year of cull walnuts which formerly brought a mere pittance. These low-grade walnuts, furthermore, tended to depress the price of the first-class nuts, but by finding a market among bakers and confectioners for the culls the prices received for the better grade of nuts have improved materially.

What the new machine has done is to make much more profitable the cracking and sorting of the lower grade of produce. At a plant where it was introduced more than a year ago, 200 women are now employed in sorting nuts cracked by four machines, each of which has a capacity of five tons of nuts per day. These women are employed five months in the year.

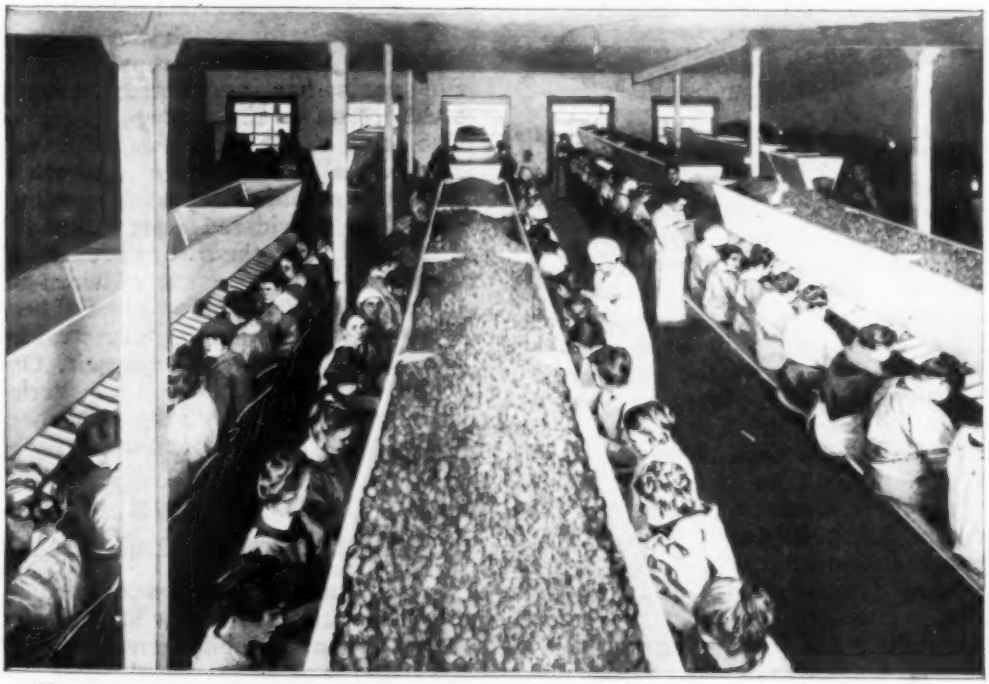
From a large hopper the nuts drop one at a time into cylinders that convey them to the upper ends of long grooved fingers, ranged vertically in

pairs. These serve as crushers, one of each pair moving toward the other a fraction of an inch—just enough to break the shell of the nut caught between them. Only about 20 per cent of the meats from the culls—those in the larger nuts—are broken and these are sold at a reduced price.

Owing to oversight on the part of the sorters many good meats are thrown into the shell heap. For the purpose of recovering them the shells are shoveled into a separator having a moving screen through which the smaller particles of shell and nut meats fall. Suction is employed to draw off a greater part of the shell fragments, but what remains with the meats is separated in various other ways, the meats being sold to bakers for nut-sprinkled layer cakes, and the like. It is claimed that the separator saves over $50 worth of nut particles per day.



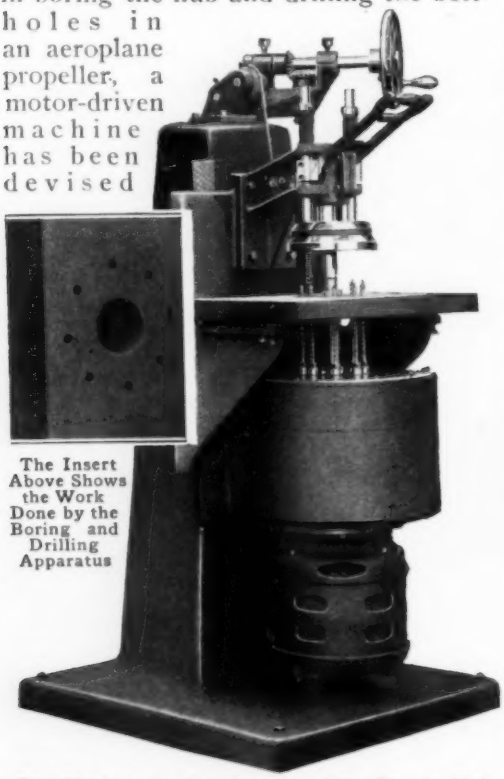
Machine for Cracking English Walnuts: The Nuts are Fed between Vertical Fingers Which Close In on the Nuts Just Enough to Crack the Shells



Women Separating Walnut Meats from the Shells of Nuts Cracked by the Machines: Each Cracker Handles Five Tons of Nuts per Day

DEVICE CUTS HUB AND BOLT HOLES IN PROPELLERS

Because of the extreme care required in boring the hub and drilling the bolt holes in an aeroplane propeller, a motor-driven machine has been devised recently which does the work with great accuracy in one operation. Fine adjustments of the drill table, on which the propeller is placed, are made by setscrews to get it perfectly level. This is necessary in order that the holes be square with the hub. A lever arrangement is employed to clamp the work firmly while the several bits are operating in unison from the underside and the bore is cutting the hub through from the upper surface. The casting that holds the drill table is counterbalanced on guides so that the feeding is controlled by a gear at the top. The drill spindles are driven through spiral gears from a central cutting spindle connected at the lower end with the motor.



The Insert Above Shows the Work Done by the Boring and Drilling Apparatus

The Machine in One Operation Cuts Out the Hub and Eight Surrounding Bolt Holes of an Aeroplane Propeller

WARE OF SOLID NICKEL RIVALS ALUMINUM

There is an increasing demand for articles of solid nickel as people come to feel that their advantages more than offset their extra cost. Unlike nickel-plated ware there is no outside coating to be rubbed off, leaving a surface that tarnishes or rusts. Before the war a large amount of nickel ore was shipped to Europe from this side of the Atlantic, made into articles, and then returned to the United States as imports, under foreign trade-marks. But in the last four years concerns in this country have been making this solid-nickel ware themselves, the material being furnished them in various forms, including sheets and castings. This metal can be cleaned much easier than aluminum, hot water and soda being sufficient to bring back the original luster. It is also remarkably resistant to acids commonly found in foods.

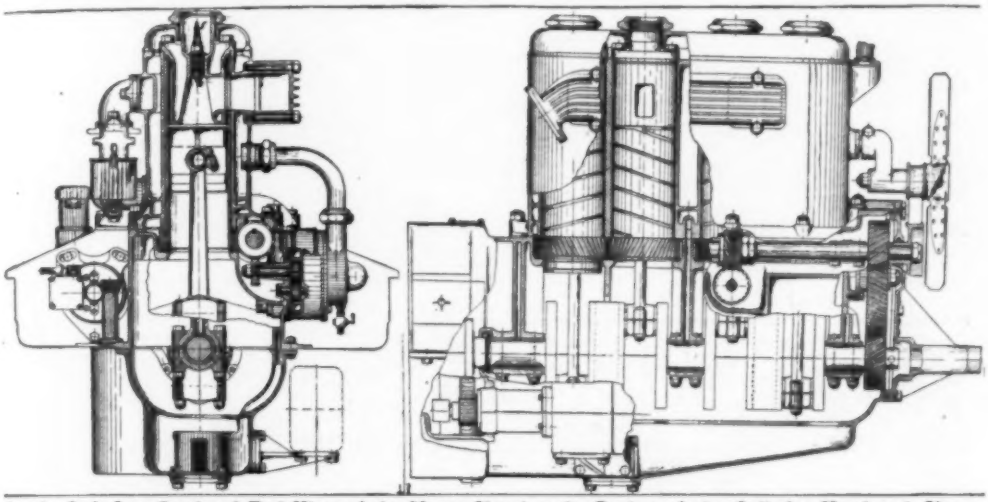
ALLIES GET BY-PRODUCTS FROM WORN-OUT SHOES

The care with which the shoes of European soldiers are repaired again and again has undoubtedly been a great lesson to the average American who clings to many wasteful pre-war habits. However, a shoe which had worn out after repeated mendings would be considered worthless by a Yankee. Not so the thrifty French and English. From one ton of worn-out shoes, about 560 pairs, they have been able to obtain various products valued at $82, or about 15 cents per pair. One of the surprising items in the varied list of by-products from these old shoes is about 480 pounds of metal.

NEW SLEEVE-VALVE MOTOR OF SIMPLE CONSTRUCTION

Much interest has been aroused by the introduction of a new sleeve-valve motor for automobile purposes. In construction it is manifestly different from other engines of the type, but in

general appearance follows the lines of conventional designing. The dominant feature is the arrangement of the sleeve, which revolves inside of the cylinder and around the piston in a film of oil, instead of moving up and down. Its two ports alternately register with others in opposite sides of the cylinder wall, and in so doing form the intake and exhaust openings. Obviously the ports can be made of any size so as to insure efficiency. The timing is controlled by the rotary movement of the sleeve, which makes one revolution to four revolutions of the crankshaft. This form of construction is applicable to motors of four, six, eight, and twelve cylinders. Also it is claimed that it eliminates approximately 100 of the usual engine parts from motors of four cylinders.



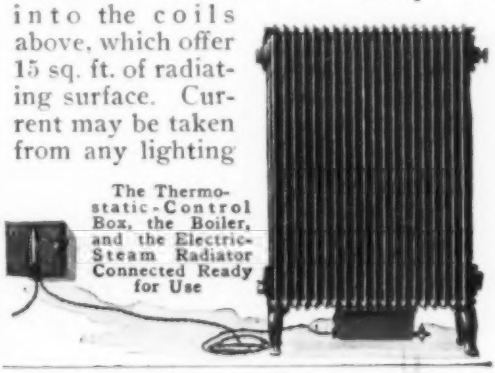
At the Left Is a Sectional End View of the Motor Showing the Design of the Cylinder Head and Sleeve-Driving Shaft. The Side View at the Right Shows Cylinder and Crank-Case Construction

IMMENSE "WAR TERMINAL" IN SOUTH BOSTON

All preparations were completed some time ago for starting work on the huge "National Terminal" in South Boston which is designed to handle a large amount of the government business incident to maintaining our forces in Europe. The main storehouse will rank as one of the largest in the world, its length being 2,400 ft. In order that it may be utilized for industrial purposes after the war in case it is not converted into a base for the emergency fleet, it is to be of modern factory construction. There will also be two large railroad yards, partly on made land, with double tracks so placed that cars can be unloaded directly into vessels.

ELECTRIC-STEAM RADIATOR WITH AUTOMATIC CONTROL

For home and office use an electric-steam radiator with thermostatic control, which enables a constant temperature to be maintained automatically, is being introduced. An immersion heater provided in the boiler attached to the bottom of the appliance converts the water into steam. The latter passes into the coils above, which offer 15 sq. ft. of radiating surface. Current may be taken from any lighting socket. The device weighs only 50 lb. and can be easily moved.



The Thermostatic-Control Box, the Boiler, and the Electric-Steam Radiator Connected Ready for Use

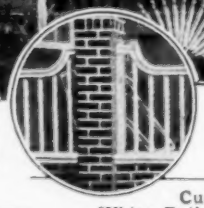
SOME GARDEN WALLS AND BACK-YARD FENCES

As Effective a Barrier as One could Wish Is a Cactus Hedge Such as This. No Man or Beast would Attempt to Penetrate It, for It Is 15 Feet High and 10 Feet Thick

Solid Concrete Has a Tendency to be Forbidding Unless Ornamented Intelligently

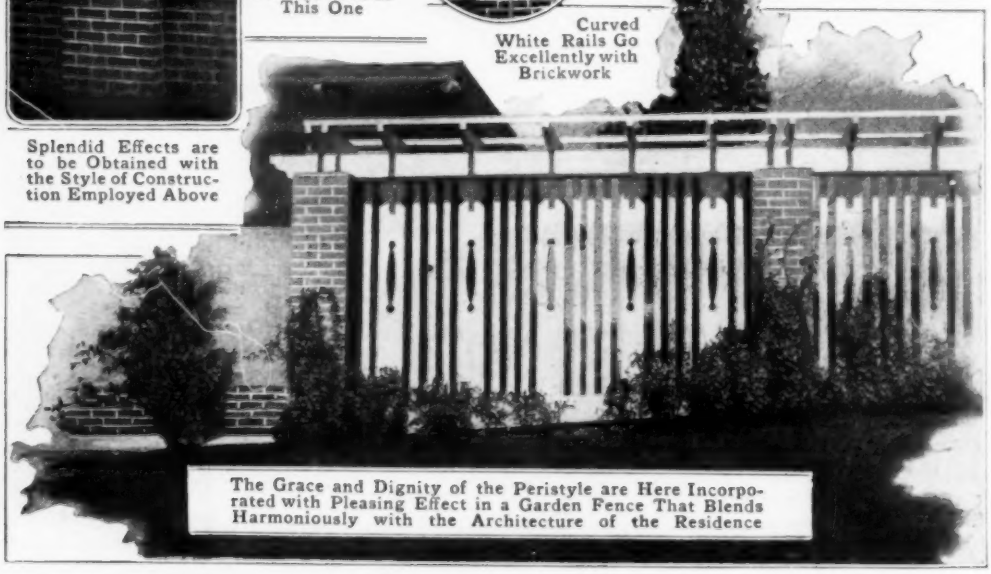
Splendid Effects are to be Obtained with the Style of Construction Employed Above

An Odd Green and White Fence with the Pickets in Fan-Shaped Designs



Once in a While a Garden Wall Is a Thing of Beauty, Such as This One

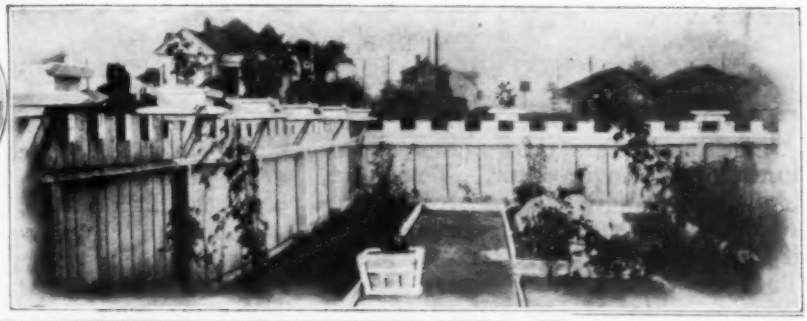
Curved White Rails Go Excellently with Brickwork



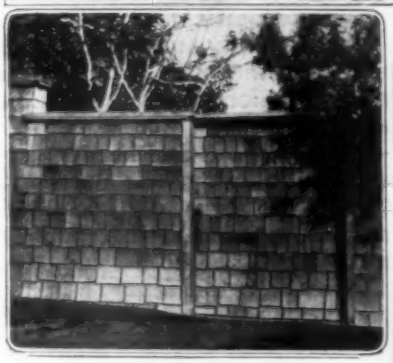
The Grace and Dignity of the Peristyle are Here Incorporated with Pleasing Effect in a Garden Fence That Blends Harmoniously with the Architecture of the Residence

THAT ADD TONE TO WELL-PLANNED GROUNDS

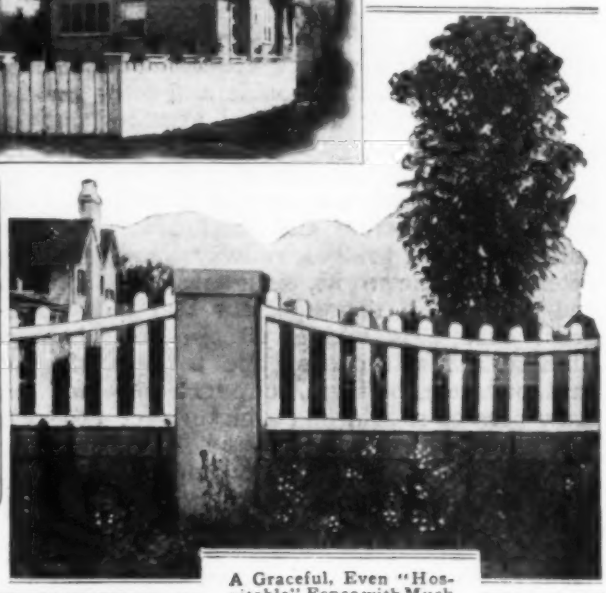
Flower Boxes Like the One Above are Placed at Intervals along the Fence



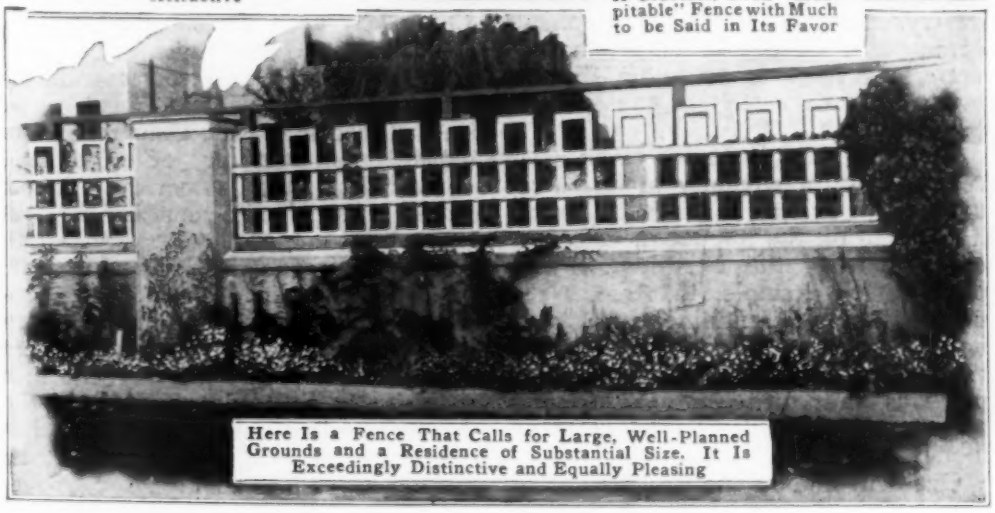
From Both Sides the Effect Is Artistic, as the Pictures Above and at the Left Show



Surrounding a Shingle Bungalow, or One Built of Bowlders, Logs, or Weathered Shiplap, a Shingle Fence Is Often Attractive



A Graceful, Even "Hospitable" Fence with Much to be Said in Its Favor



Here Is a Fence That Calls for Large, Well-Planned Grounds and a Residence of Substantial Size. It Is Exceedingly Distinctive and Equally Pleasing

CHINA A GREAT FIELD FOR AMERICAN INVENTORS AND PRODUCERS

By F. H. WILLIAMS

Trade-Mark Specialist

TODAY the Orient, particularly China, offers tremendous opportunities for the inventor. There are, likewise, splendid chances for the resourceful merchant and manufacturer if he is ready to meet oriental needs. To be specific: The Chinese in the principal cities of China have adopted the electric iron for household use and, to an extent, the percolator, heater, toaster, etc. But sales would be far greater if importers would take account of the fact that the Chinese do not use the screw sockets we are accustomed to, and so are at the trouble and expense of securing additional attachments.

The traveler in China today sees the beginning of a new and wonderful era, marked by concrete and steel office buildings, great bridges, railways, and extensive public works, such as canals and dams. All this indicates that a great change is taking place. The Chinese are still cutting the tin for cups, pails, etc., by hand, but punch and draw presses should find a big market among this awakening people. The introduction of machinery would release multitudes from manual servitude but it would not displace labor. Rather it would increase the amount of labor needed by a keener development of industry. But in designing equipment of any sort for use in China, the all-important thing is to know Chinese needs intimately—to get the Chinese point of view.

From the standpoint of quick sales the greatest opportunity in China today is in marketing cosmetics. No one has placed on the market in China, or other parts of the Far East, a face powder, for example, that meets the needs of oriental feminine complexion, nor has anyone developed a perfume of the desired sort since the French output was shut off. And yet oriental women will go without food to spend money on "beauty" products!

One will find in the drug stores of many Chinese cities, among the items chiefly in demand, face and tooth powders, perfumes, bust developers, nail polishers, hair tonics, eye baths, neck beautifiers, plumping creams, etc. There is no end of opportunity for the American inventor and producer that will give China the things wanted in these lines, particularly by her women.

Already the younger generation has developed a fondness for fancy hand bags, cut glass, engraved cards, platinum wedding rings, and the like. All of this indicates, of course, that the old saying that in China fashions change only once in a dynasty, does not hold true today. At the present time there are large opportunities for up-to-date fashion stores, selling apparel designed by persons on the ground and with sufficient concession to Chinese tastes and traditions.

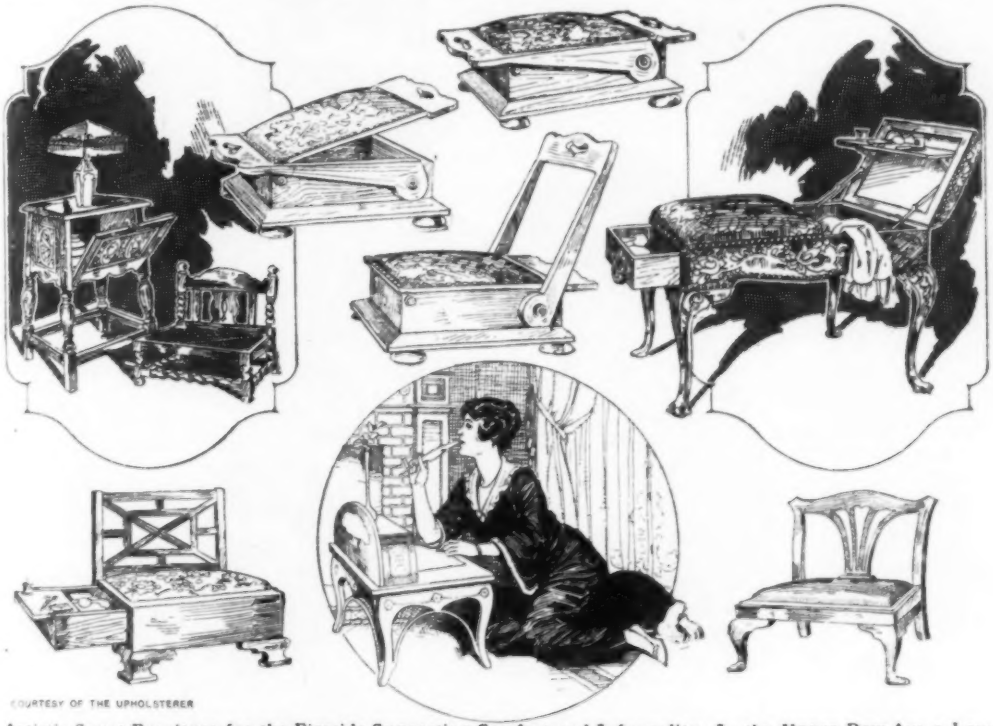
Hair-dressing shops and beauty parlors are common in the Far East, and this line offers an especially good field for American women in that part of the world. Much might be said, too, about the market for fancy hosiery, corsets, children's apparel, fleece-lined underwear, and so on.

The demand for American cigarettes of various grades is enormous. Four billion cigarettes were shipped to China last year, 100,000,000 to Siam, 1,000,000,000 to the Straits Settlements, and to other parts correspondingly large quantities. While China grows much tobacco and the Chinaman is an expert manufacturer of cigarettes, nevertheless the American "short smoke" has gained a remarkable popularity.

Today all countries in the Far East offer the American inventor and producer opportunities in almost every line, and they will offer still greater opportunities in the future. The first requisite is an understanding of the oriental's viewpoint, something that one widely traveled American said took him three years to acquire.

NOVEL SQUAT FURNITURE FOR FIRESIDES

Squatty chairs, writing desks, and stools with backs are among the interesting novelties found in new furniture of English design. They are intended especially for use in front of a fireplace where members of a company often like to gather in comfortable, informal postures. One such low chair is provided with a drawer at one side furnished with an inkwell, space for stationery, etc., making fireside letter writing particularly attractive. The top of an upholstered bench is divided in half, one portion being hinged so that it can be turned up, revealing a compartment for sewing and bringing into place a handy shelf for shears, thread, and the like. Lower stools—always a convenience about a fireplace because so easily moved—have been improved with hinged backs that can be turned down when not in use. Beneath the seats are compartments for fancy work.

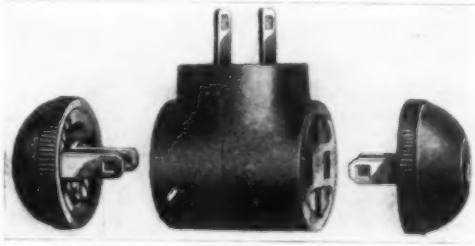


COURTESY OF THE UPHOLSTERER

Artistic Squat Furniture for the Fireside Suggesting Comfort and Informality: In the Upper Row Are a Low Writing Desk and Chair, and Stools with Folding Backs and Hidden Compartments. In the Lower Row Are a Squatty Desk and Chairs, One with a Drawer for Writing Material in the Side

COMPACT ADAPTER DOUBLES CAPACITY OF A SOCKET

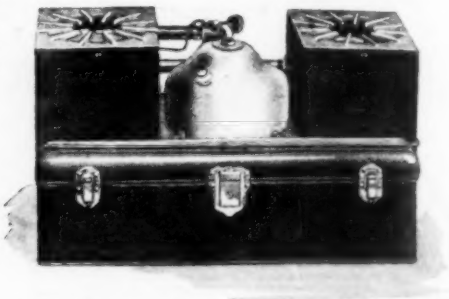
A new adapter with which a single electric socket can be utilized to supply current through two cords at once is especially attractive to the householder, or other user, because so compact. Hemispherical plugs for the two cords are fitted into suitable recesses provided in opposite ends of the fixture, and socket connections for the adapter itself are provided on the side.



New Adapter Occupying Small Space with Which Current from a Single Socket can be Supplied to Two Electric Devices

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

Carrying Case for Folding Camp Stool, a Convenient Accessory for Those Who Frequent the Woods or Beach. Price $1.75

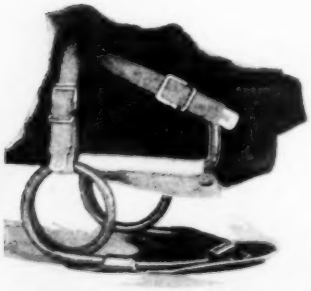


Supplied in a Steel Carrying Case That may be Attached to the Running Board of a Car: A Two-Burner Gasoline Stove for Motor Tourists

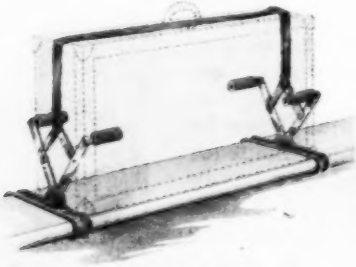
Wire Tongs for Removing Vegetables from Cooking Vessel or Oven: They Are Also Helpful for the Purpose Illustrated

This Perforated Pan, Designed to be Used in Rinsing and Draining Dishes, Nests in the Dishpan When in Disuse

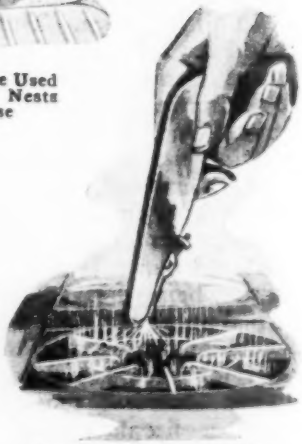
Artistic and Serviceable Oil Lamp That Fits Any Candlestick. Price, without Shade, 75 Cents



Spring Knee Hammock for Those Whose Work Compels Them to Kneel Much of the Time. Price, Pair, $2

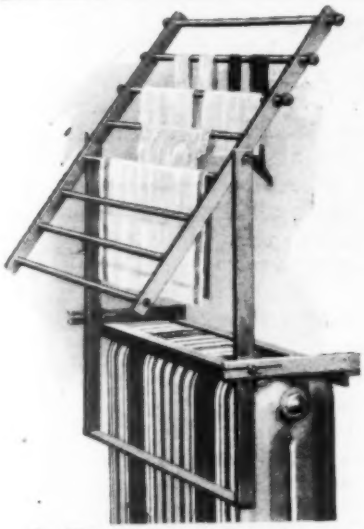


Serviceable Luggage Holder for the Running Board of a Car: It is Quickly Attached

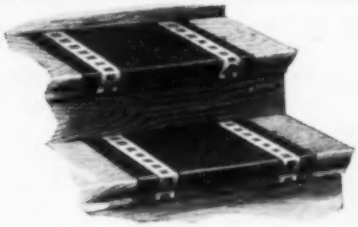


Gas-Lighting Gun That Throws a Stream of Sparks When the Trigger is Pulled

INTENDED FOR THE HOME AND ITS MEMBERS



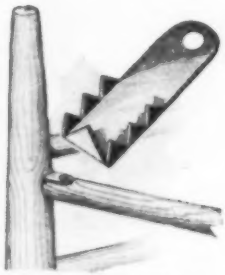
In Wintertime the Drier is Clamped to the Top of a Radiator. In Summer It may be Hooked to a Window Sill Where the Sun will Strike the Clothes. Price $1.50



Economical Way of Carpeting a Stairway: Treads with Patented Fasteners for Each Step Enable Worn Ones to be Replaced

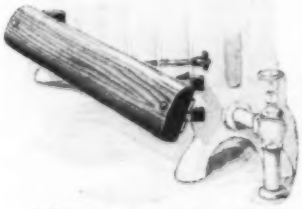
For the Soldier or Camper: Folding Washbasin Made of Waterproof Material and Collapsible Frame. It Makes a Compact Roll

The Khaki Sling Enables a Soldier to Carry a Vacuum Bottle Filled with Hot Coffee or Cold Water. Price, Complete, $2.75



When Dry Heat Causes Chairs to Fall Apart, Metal Fasteners, of the Type Shown, Are Convenient. They Hold Legs and Rungs Rigidly in Place

Intended Particularly for Airmen, but Suited Also for Motorists: Gloves That Give Great Warmth and Free Use of Hands and Fingers. Price $10



Adjustable Foot Rest That may be Attached to Steam or Hot-Water Radiators of Any Type

Cold-Pack Home-Canning Outfit with Deep Boiler and Special Wire Holders That Enable Jars to be Placed on Top of Each Other, Thus Conserving Fuel

HANDY AUTO-PARTS BIN FOR MODERN GARAGES

A case to hold extra auto parts and accessories is now being made for modern garages, which in every way is

Bin for a Garage, Having 120 Compartments Where Parts and Accessories can be Stored So as to Be Easily Accessible

more satisfactory than the miscellaneous collection of cigar boxes and crude shelving often employed. This cabinet is of oak and steel and stands about six feet high. In front of each of the 120 pigeonholes contained in the case is a label holder into which can be inserted a card showing the name and number of the parts on hand.

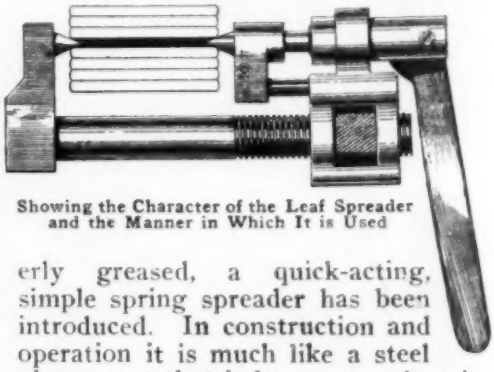
VAST SUMS SET ASIDE FOR ROAD BUILDING

More than a quarter of a billion dollars is to be spent, during 1918, on highway improvement in the United States by Federal, state, and county authorities, according to recent reports. This sum far surpasses the expenditures of any previous year and indicates how war needs and the growing automobile industry are revolutionizing American transportation. Last year the total expenditure, approximately $144,000,000, was considered large, and yet so great is the present need, due in part to the inadequacy of our railways, that the 1918 figure is regarded as only "a drop in the bucket." Government officials believe that with good highways motor cars could carry about 200 per cent more than the railroads.

Texas leads all the states in its road appropriation this year, $25,000,000 being the amount set aside, as compared with $5,000,000 last year. Of the first-mentioned amount, the Federal government gives about $875,000. The greatest activity in highway improvement, relatively speaking, will be in the South and middle West where unprecedented truck travel is making immediate repairs imperative. Iowa is making an exceptional record by appropriating $15,000,000, which is the same amount as was set aside last year. Tulsa County, Okla., is one of the banner counties of the country with an appropriation of $1,750,000. Arkansas' share this year is $12,000,000 as compared with $4,000,000 last year. Illinois and Indiana rank next to Texas with approximately $17,000,000 each.

NEW LEAF SPREADER HELPS IN GREASING SPRINGS

To expedite the motorist's task of keeping laminated leaf springs prop-



Showing the Character of the Leaf Spreader and the Manner in Which It is Used

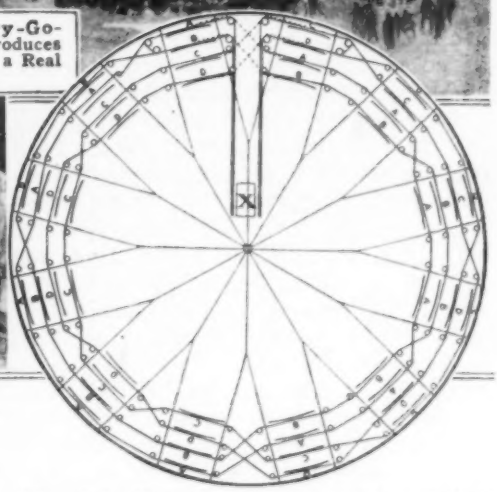
erly greased, a quick-acting, simple spring spreader has been introduced. In construction and operation it is much like a steel vise except that it has two wedges instead of jaws. It separates the leaves and locks itself, leaving the worker's hands free for applying the lubricant. It is then released by a pull on the lever.

IMPROVED MERRY-GO-ROUND IMITATES DERBY RACES

One of the latest mechanical thrillers for amusement seekers is a merry-go-round equipped with horses so mounted that their relative positions are constantly changing, thereby affording an exciting imitation of a race. The horses are mounted four abreast on a revolving platform, their supports extending through slots 7 ft. long in the platform and connecting with cables concealed underneath. By means of an automatic electric device, which is connected with the cables and, like them, revolves with the merry-go-round, each horse is alternately advanced and retarded, within the limits of the slots referred to. The cables cross each other, passing from row to row so that the horses in each row, and also in each set of four, advance at various speeds. At the outset and during the last lap a gong sounds automatically, giving another realistic touch to the race.

The New Merry-Go-Round That Reproduces All the Thrills of a Real Race

The Start of the Race: As It Progresses the Horses in the Rear will Gradually Gain on Those Ahead and Perhaps will Finish in the Lead

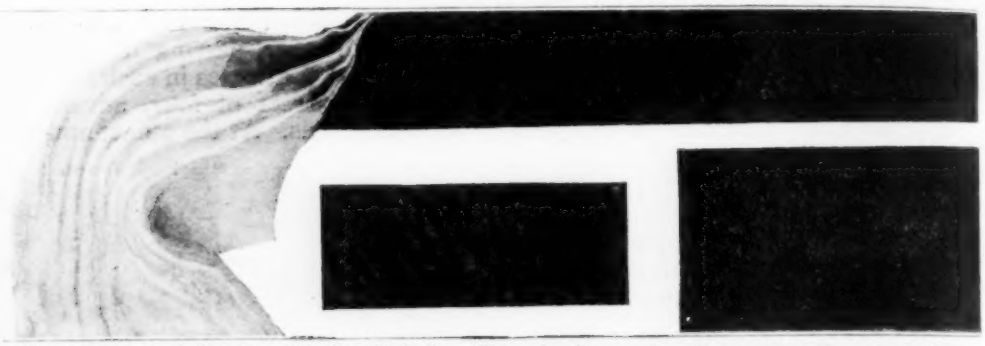


Plan of the Merry-Go-Round: The Lines A, B, C, and D Are the Crossed Cables with Which the Relative Positions of the Horses are Changed during a Race

NEW LEATHER SUBSTITUTE OF UNWOVEN COTTON

A process for making a new kind of leather substitute has been developed which bids fair to overcome very largely the leather shortage, now so acute. A company has already been formed to manufacture the new product which is made by compressing unwoven cotton, the fiber being in the form of batting or roving, as the slightly twisted fibers are called. A substance is obtained that is made of closely interlaced strands and so resembles leather structurally. It also has a toughness comparable with that of high-grade leather.

Machines have already been designed for making shoe laces, belts, and straps, and only slight changes would be needed to turn out a product several feet wide. The cost of the new sub-



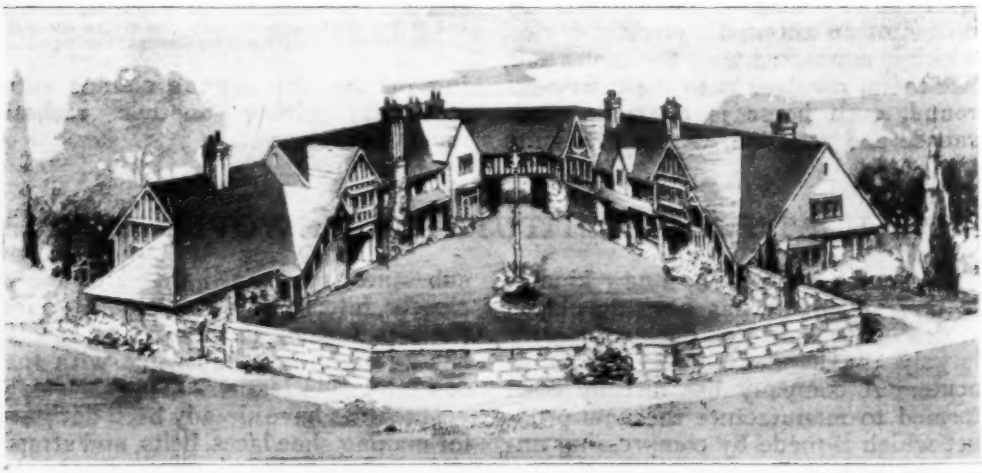
Three Samples of Imitation Leather Made from Unwoven Cotton: The Upper One Shows Part of the Batting Before It is Dipped in the Various Solutions and Compressed. Any Desired Grain can be Obtained

stitute is said to be only a fraction of that of leather, and it can be embossed and dyed to look like leather of any grain or hue. In making laces, strips of cotton roving are passed through a binding solution and then wound onto a drying reel. After this, they are fed between steel-roller dies, where compression is begun, and between circular reducing dies that bring them down to the size and shape of flat or round laces. Nonmetallic tips are formed by compressing the ends still more. A curing and finishing bath produces a tough wearing surface. Belts are made in much the same manner as laces, except that the edges of the strips are folded over during the process to inclose reinforcing threads imbedded in the material.

VILLAGE-BEAUTIFUL PLAN PAYS, CONCERN FINDS

Not as a philanthropy but for the sake of business efficiency and justice to its employes, a large eastern manufacturing concern has interested itself in a notable village-beautiful movement. A fine tract of 15 acres has been acquired adjoining the plant, not far from the village of Danielson, Conn., on which houses costing $1,900 to $5,600 are being erected, the latter being four-family structures. These are sold to employes only, or rented at rates ranging from $10 to $16 per month. It is claimed that their equivalent could not be rented elsewhere for less than $30 to $40 per month.

No workers are required to live in



COURTESY OF WILLIAM H. COX

Factory Employes' Homes: One of the Newest Developments in the Village Beautiful, near Danielson, Connecticut. This Structure will Accommodate 14 Families and the Apartments of from Three to Five Rooms Rent for $3 to $4 per Week

these houses, but there is a strong demand for them, and to the 18 completed last year enough will soon be added to make the total at least 100. The holding company transacts its business without profit, a fact that accounts for the low rents and very advantageous terms of purchase. The concern feels that the investment is yielding abundant returns in the character of employes obtained and in their increased efficiency.

NEW ARTIFICIAL BAIT HAS SCALELIKE FINISH

Artificial baits of improved type have recently been put on the market which, because of their finish, are remarkably lifelike reproductions of live minnows. The back of each is painted an appropriate dark hue, while the sides gradually shade into the light color covering

New Artificial Bait Finished with What Looks Like a Coating of Silvery Scales

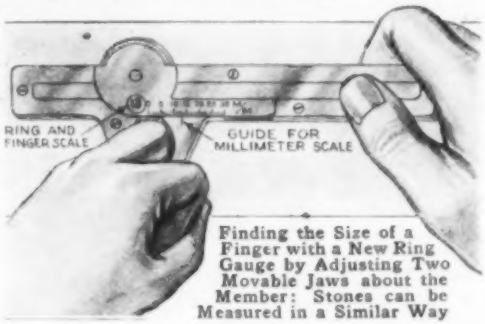
the belly. The sides and belly are mottled with a representation of silvery scales that make the bait appear surprisingly like a minnow.

FRAME OFFICE BUILDINGS FOR EXTRA WAR CLERKS

So enormous has been the increase of business done by the War and Navy departments that the government has erected three huge structures to accommodate the overflow of employes. Each is a frame structure, covered with stucco and having a frontage of 474 ft., with wings extending between six courts. Bridges afford direct communication between the wings. The cost of these temporary quarters is said to total $2,000,000. The central unit of the three includes a heating plant. The plans also provide for a cafeteria for the convenience of employes.

RING GAUGE FOR JEWELERS HAS MANY USES

A combination gauge for jewelers has been devised for measuring finger rings, fingers, set and unset stones, and

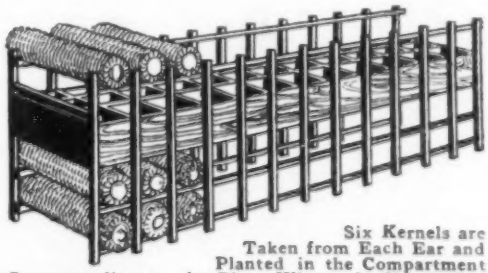


Finding the Size of a Finger with a New Ring Gauge by Adjusting Two Movable Jaws about the Member: Stones can be Measured in a Similar Way

the amount of metal needed for rings. By turning a dial at one end of the gauge, the distance between two jaws is changed to fit the object being measured. In case it is a ring the size number appears in an opening in the dial casing. Dimensions in millimeters are shown by a graduated scale on the side.

RACK FOR TESTING SEED CORN IN SOIL

For the purpose of testing seed corn in soil—a method said to be more accurate than testing it in water—a 3-ft. open rack has been devised containing supports for three tiers of 12 ears each. There is also incorporated in the rack a box divided into 36 compartments. The selected ears of corn are placed in the open frame and at the same time



Six Kernels are Taken from Each Ear and Planted in the Compartment Corresponding to the Place Where the Ear is Put

six kernels are taken from each and planted in the soil-filled compartment corresponding in position to that of the ear in the rack.

UNUSUAL AND PATRIOTIC DOINGS OF CHILDREN

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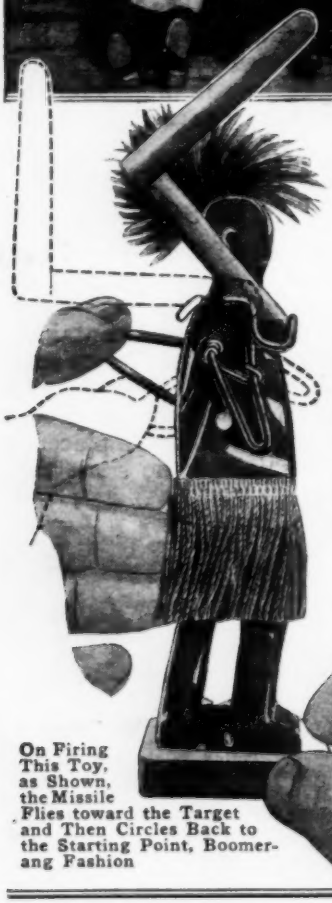
Among Those Who Believe That in War Time Knitting Is Not Alone for Women and Girls, Is a Group of New York Choir Boys Here Shown, Each Doing His Bit Gladly and Well

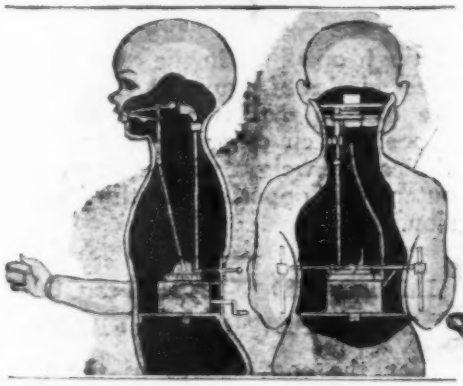


On Firing This Toy, as Shown, the Missile Flies toward the Target and Then Circles Back to the Starting Point, Boomerang Fashion

Two Deaf Boys from Berkeley, California, and the Clever Racer They Built from Odds and Ends

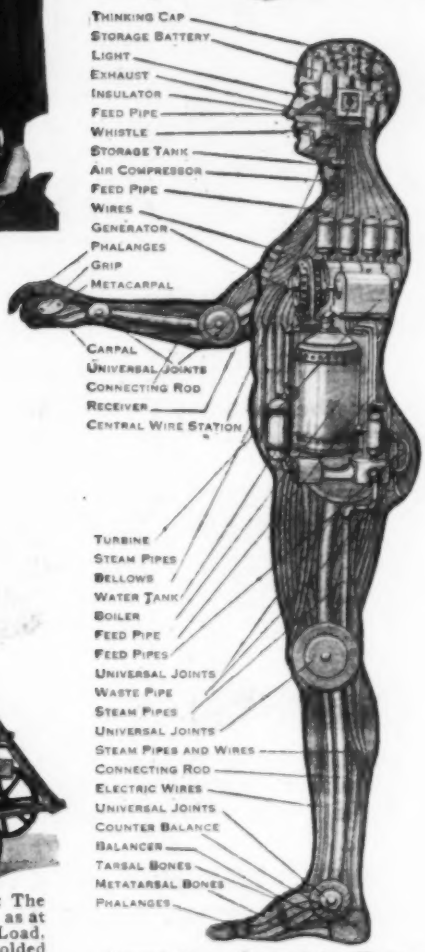
Two Pictures of the Same Girl, Margaret Lawrence, Aged Nine, of Meridian, Mississippi: Being a True Patriot She Wanted to Raise Money to Buy Thrift Stamps and So Sold Her Beautiful Hair. She was Paid $315 for It

A Fine Convalescent's Robe for a Hospital in France, Made of Squares Knitted by Children in a Birmingham, Alabama, School



This Doll Talks and Sings, Moving Its Lips Just Like a Person. The Diagram Reveals the Secret, Which Is a Tiny Phonograph, Hidden Inside

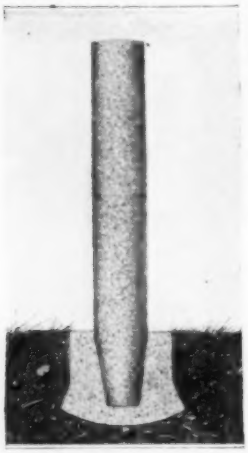
Two Wagons in One: The Body can be Opened, as at the Left, to Carry a Load, or the Halves Folded Together to Make a Coaster



Almost Every Part of the Human Body Has Its Mechanical Counterpart, and So John L. Herzog, Aged 13, of Saginaw, Michigan, Whose Picture is Shown Above, Sketched This Remarkable Diagram to Illustrate the Idea

CONCRETE POST PROVIDED WITH SEPARATE BASE

A new type of concrete post is composed of two parts, a base and the post proper, the latter being tapered at its lower end to fit into the base. When the proper digging has been done a core, shaped like the post end, is held in place and concrete poured around it. After the core has been removed the post can be set whenever desired, the task of lining it up and cementing it in the base requiring but a few minutes.



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WINDSHIELD PAD PREPARES GLASS FOR RAINSTORM

For the motorist there is a small chemically treated pad that, when rubbed over the wet surface of a windshield, prepares the glass so that raindrops will not adhere to it and obstruct the vision of the road ahead. The water is caused to spread out in a transparent film. The accessory is particularly convenient because of the form in which it is provided.

PHYSICS TEACHER INVENTS SUBMARINE CHASER

After several months of experimenting a professor of physics at the University of Wisconsin has developed a submarine chaser which, according to a recent announcement, is so equipped that it can detect the presence of U-boats within a radius of three or four miles, and tell the direction in which they lie, within four degrees. Following successful tests conducted secretly on Lake Mendota, near the university, the inventor has been given a leave of absence and is now in charge of government work related to his invention.

DEVICE FOR CALCULATING WEIGHT OF ICE CAKES

A calculator has been devised with which one can quickly ascertain the weight of a cake of ice, if its three dimensions are known. It consists of a card with a revolving dial attached to its back. On the face of the card are two concentric circles of figures, while on the dial, visible through openings in the card, are two other circles of figures. After moving the dial so that two dimensions are opposite each other in the two inner circles, the weight will be found in the outer row, opposite the third dimension.

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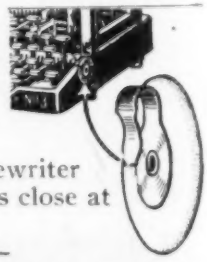
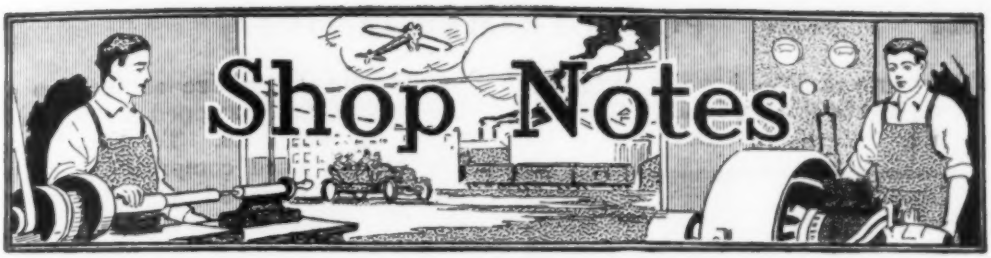
IMPROVED ERASER HOOKS TO TYPEWRITER FRAME

For the convenience of the typist who is apt to misplace his eraser, one has been devised which is provided with a metal hook. By this means it can be hung on the typewriter frame and so is always close at hand.



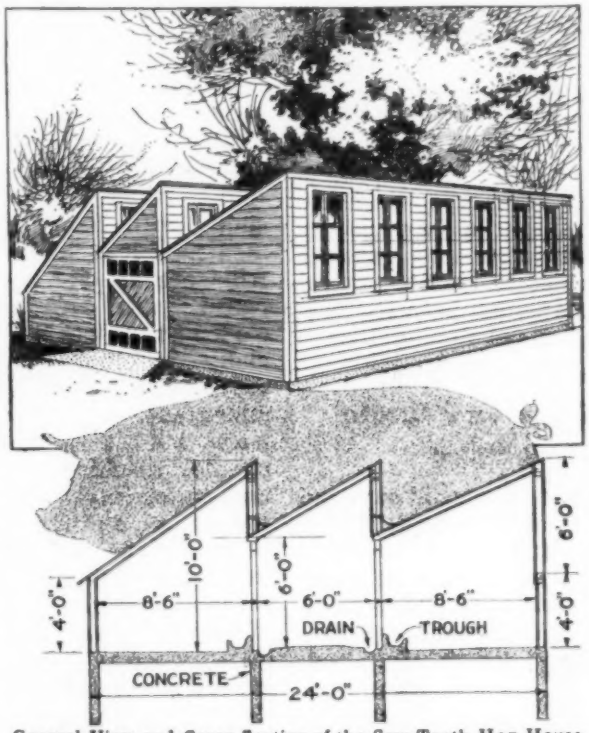
¶A remarkable machine is being widely introduced in knit-underwear mills which, in sewing parts of a garment together, makes a flat, smooth, elastic, nonraveling seam.



A Sanitary Hog House of Saw-Tooth Design

By HERBERT A. SHEARER

ABUNDANCE of fresh air and sunshine is one of the most important requisites in the care of little pigs and brood sows, and in recent years many excellent types of hog houses have been designed with this consideration in view. Some of these are of very expensive construction, with windows carefully placed and at scientifically correct angles to admit the direct rays of sunlight into the nests during March and April and again in September and October, the usual farrowing months in the latitude of central United States.



General View and Cross Section of the Saw-Tooth Hog House, Showing Its Exterior Construction and the Provisions for Sanitation That are Made in the Interior: The Dimensions are Given as Details for Building

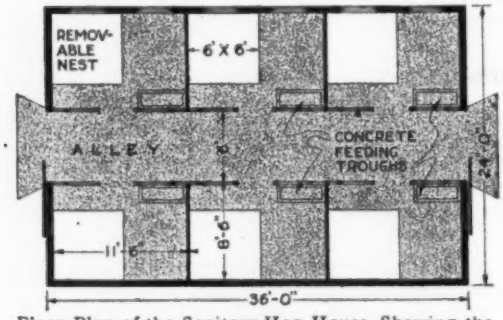
One of the most practical of these hog houses is the saw-tooth design illustrated. It is cheaper to build than most of the others, and with its three rows of windows, placed just above the nests, the desired results are obtained most effectively. The rows of windows are so arranged that through the greater portion of the day the house is flooded with sunlight, yet it will be noticed that the structure of the roof is such that the heat stored within during the day is not rapidly radiated at night. This is a desirable feature, since extremes of temperature should be avoided wherever possible.

The perspective illustration shows, in a general way, the exterior construction of the building. In the floor plan it will be noticed that the center alley is made to serve as a feeding room, transfer alley, and place for the drainage gutters. It also forms a passage through the structure from end to end.

The concrete floors in the pens slope slightly from the sides of the house to the alley, to aid cleaning. Overflow from the running water in the troughs is kept out of the nests by reason of the gutters in the alley being lower.

The gutters also have a lengthwise slope of about 1 in. in 10 feet.

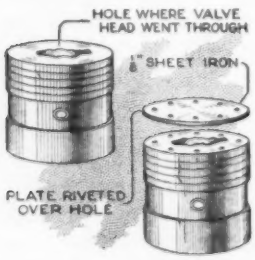
The center saw-tooth roof is supported on 4 by 4-in. posts. These posts also form the alley partitions for the pens. The alleys are 6 ft. wide. This width ordinarily will be found adequate, as it will permit the use of a two-wheeled feed cart, and a wheelbarrow may be brought in for purposes of cleaning. Galvanized-iron gutters, as shown in the cross section, carry rain water accumulated between the saw teeth to the ends of the building.



Floor Plan of the Sanitary Hog House, Showing the Arrangement of the Interior, Nests, Concrete Feeding Troughs, and Other Features: Gates may be Added to the Pens, or in the Alley, as Desired

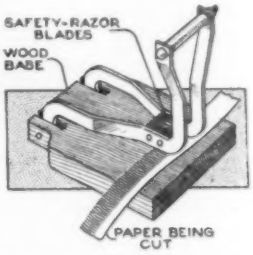
Emergency Repair for a Broken Motorcycle Piston

A broken valve in a motor always results in a broken piston head, if the head of the valve falls inside the cylinder. It was my misfortune to have this experience while many miles from any railroad and several hundred miles from the nearest agency where spare parts could be obtained. In a ranchman's workshop inspection showed that the valve head had gone through the piston edgewise, making a clean-cut hole. After removing the broken parts, I effected the repair shown in the sketch. A sheet-iron plate, 1/8 in. thick, was cut exactly the same size as the top of the piston and fastened down with eight copper rivets. To compensate for the increased compression resulting from the plate, a heavy fiber gasket was placed under the cylinder. When assembled, the motor held compression well enough to get started, and after being run for a time with an abundance of oil, it held perfectly. The repair not only got the machine home under its own power, but is still in service after more than a thousand miles of use.—Edwin Edgerton, Alhambra, Calif.



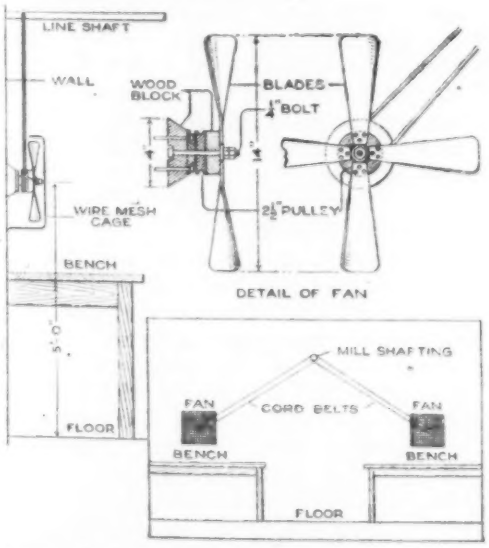
Paper-Ornament Making Machine for Restaurant Use

Restaurant owners who endeavor to please the eye as well as the palate of their customers have long made a practice of adorning the unsightly shank bones of fowls, steaks, and chops with fancy tissue-paper ornaments. But such frills are an expense which counts, especially in these war times. One restaurant owner has built a simple machine and is now making his own paper ornaments during the slack hours that most restaurant people experience between meals. The machine consists of two iron braces, bent and mounted on a wooden base. Between these braces five safety-razor blades of the two-hole type, attached to bolts and with leather spacers between them, are placed as shown. Strips of colored tissue paper to be cut are passed over the board while the handle of the machine is lifted and the blades are pressed down as the paper is moved along. After the edge of the paper has been shredded the strip is cut into the desired lengths, to be rolled and tied for the adornment of dishes according to requirements.—H. Rousset, Washington, D. C.



Fans Belted from Mill Shaft Give Comfort to Workmen

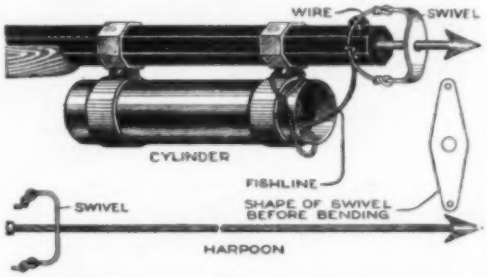
At no expense whatever for power any workman may have comfort through the hot summer months by mounting an old automobile-radiator fan as shown in the sketch, and driving it with a belt from any convenient revolving shaft. The fan is usually obtainable for a trivial sum at any automobile-wrecking house, or if unavailable, it may be made from heavy galvanized iron. The fan hub and its mountings should be of oak, or other hard wood, and the bearing upon which it turns may be simply a ¼-in. bolt. Of course, the more attention that is given to the bearing, the more efficient will be the action of the fan. If an old roller bearing is available, it may be converted into an excellent mounting. A window-sash pulley is riveted to the back of the fan hub to serve as a belt groove. The speed of the fan is governed partly by the speed of the shaft to which it is connected and also by the diameters of the belt grooves of the shaft and fan hub. A cage of wire mesh should in every case be constructed around the fan to safeguard against accidents.



Summer Comfort is Secured at the Bench and throughout the Shop by Installing an Old Auto-Radiator Fan and Belting It to Any Convenient Line Shaft. The Sketches Show Construction Details

Harpoon Gun for Spearing Fish Made from Old Rifle

A harpoon gun that I have made and used successfully for taking fish may be made from an old large-bore single-



An Old Rifle of Large Caliber may be Converted into a Deadly and Accurate Harpoon Gun for Spearing Fish

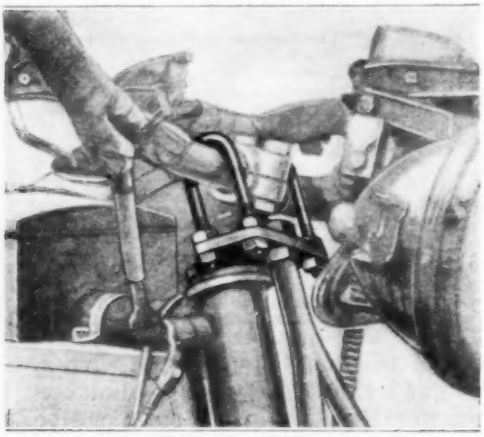
shot rifle, as shown in the sketch. A light cylinder, 1½ in. in diameter, is fastened with clips near the end of the barrel to hold a coiled line. The harpoon is then made and fastened with a swivel, as illustrated. The head of the harpoon should be hardened slightly, and is welded to the shaft after the swivel has been put in place. Blank cartridges loaded with a heavy charge of black powder are used to fire the harpoon, which for distances up to 25 ft. has almost the accuracy of a bullet. Before using such a spear for spearing fish, one should determine whether or not the practice is legal in his particular state.—Walter B. Raynor, Patchogue, N. Y.

Files Made of Sandpaper Handy in Woodwork

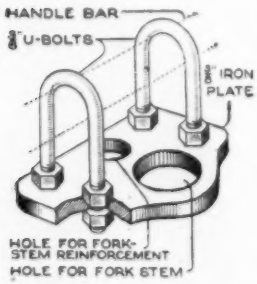
In cabinetmaking, fitting and finishing of parts must be done frequently where sandpaper cannot be applied on the usual sandpaper block. A help for working to advantage in such cases is a set of files made of sandpaper. Strips of the paper are glued to dowel pins of various sizes, to molding, and other shaped pieces, as required for special jobs. A set of standard shapes and sizes can be prepared and kept at hand for frequent use. They will last a long time if given the proper care.

Head-Fitting and Bar-Fastening Repair for Motorcycle

While nearing the finish of an otherwise successful record-breaking trial, the handlebars were torn from my machine in a spill. Inspection showed that the expander bolt was broken, and that there was apparently no way to fasten the bars on again without securing new parts. To obtain these from the nearest agency would have occasioned a disastrous delay. I rolled the machine to a blacksmith shop that happened to be near, and there effected the temporary repair illustrated. A steel plate, of the size and shape illustrated, was made and fitted over the fork stem and the end of the fork-reinforcement stem. This plate was locked in place between the head-cup fittings and the fork-stem reinforcement nuts. Two 3/8-in. U-bolts were fitted into the steel plate and tightened up after the handlebars had been passed through them, the handlebar headpost having been previously driven down into the fork stem as far as it would go. The improvised repair was completed in less than an hour. It was stronger than the original construction, and not only saved my record but gave satisfactory service for several thousand miles afterward.—E. G. (Cannonball) Baker, Indianapolis, Ind.



This Improvised Fastening for a Pair of Motorcycle Handlebars was Made in Less Than an Hour. It Proved to Be Stronger Than the Original

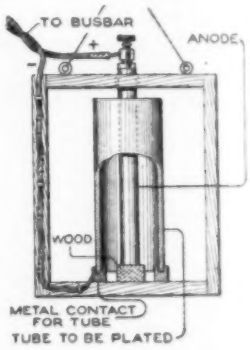


Oiling Motor Timer and Magneto Properly

The timer and magneto of an automobile require little lubrication, but it should be of the best. Pure castor oil is very effective in these places, but should be used sparingly on the magneto bearings. Several drops, two or three times a season, is all that is required.—G. A. Luers, Washington, District of Columbia.

Electroplating the Inside of a Tube or Casting

The usual method of suspending parts in an electroplating bath will not result in a uniform deposit over the inside surfaces of tubes or castings. Successful plating of inside surfaces is not difficult, however, with the use of a special, yet easily constructed, device, as shown in the sketch. A wooden frame is made, with clips, to hold the tube in position, as illustrated. A hole is provided in the top crosspiece of the frame so that the rod of the metal used in plating, zinc for instance, may be passed through and down into the center space of the tube. A flexible copper cord is attached to the rod, and this in turn is connected with the positive busbar when plating. The tube, of course, is connected with the negative bar. This application of the current causes the metal from the central rod to be deposited evenly over the inside of the tube.—K. M. Coggeshall, Webster Groves, Mo.

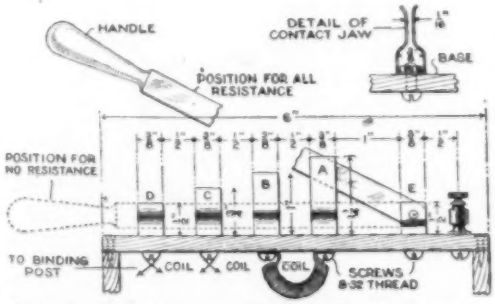


A Motor-Starting and Regulating Switch

The motor-starting, speed-regulating switch illustrated is for use with small electric motors, taking about 10 volts. But by making slight changes, the switch may be used on 110-volt circuits. The blade is of copper, ½ in. wide by 1/16 in. thick, and 5½ in. long. The contact jaws are also of copper, ⅜ in. wide and 1/32 in. thick. Four of these will be needed. A strip of the copper is bent to the shape shown, to form the jaws. The lengths of the jaws vary by ¼ in., and are made in the following lengths: 1¼ in., 1 in., ¾ in., and ½ in., one of each length. Mount them upon a piece of hard rubber, fiber, or hard wood, separating them by ½ in. The base of the switch may be the top of the box or containing case which holds the resistance coils. This box should be 6 in. long, 3 in. wide, and 2 in. deep, and lined with sheet asbestos.

On a pencil wind some No. 28 gauge German-silver wire for a distance of 2 in. Make three of these resistance coils. Connect the jaws A and B together with one coil, stretching it down until it touches the bottom of the box, and fasten down with a tack or let it remain loose. Then connect jaws B to C, and C to D. Connect D to a binding post and the blade bearing E to the other binding post.

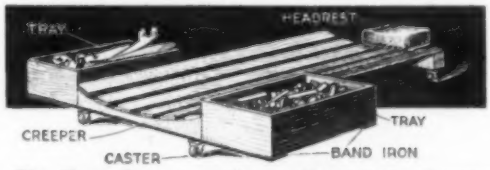
When using the switch, connect in series with the motor. To start the motor, throw the blade into contact with jaw A: all the resistance is on; then push down to B; this cuts out one coil; then to C, and lastly to D, when all the resistance is cut out.—Francis B. Dashiell, Dunkirk, Md.



This Serviceable Motor-Starting and Regulating Switch was Made from Waste Materials Picked Up about the Shop

Creeper for Use under Vehicles is Provided with Tool Trays

Probably the greatest annoyance of working under an automobile, or other vehicle, with a shop creeper is that of laying one's tools on the floor and then moving out of reach of them. This is eliminated, and much valuable time is saved, by providing one's creeper with tool trays, as illustrated. The trays are fastened by means of two horizontal bands of iron bolted under the framework of the creeper. Separate compartments for different tools may be built into the trays, if desired. With this addition, which may be quickly made to any creeper, one is able to work with all his tools at his fingers' ends regardless of how much moving about under the machine may be necessary.—Charles C. Springer, Grand Rapids, Mich.



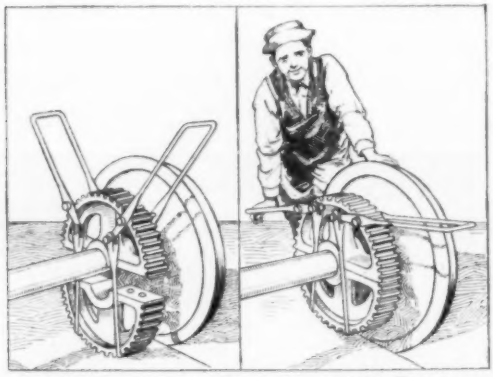
The Trays Incorporated as a Part of the Creeper Enable One to Keep All His Tools within Reach as He Moves About under a Motor Vehicle

Exploiting Old Photographic Negative Glass

Stocks of old plates that have accumulated in photographers' shops during the past years have attained considerable value and are now being purchased for recoating by the manufacturers of photographic supplies. This has been occasioned by a shortage of high-grade glass resulting from the closing by the war of the factories in northern France. These plants were heretofore the sole source of supply of such glass.—Leon A. Haloin, Denver, Colorado.

Tongs for Handling Split Gears

The difficulty of coupling the halves of split gears used by many traction



By the Use of These Tongs Large Split Gears are Easily Lifted into Place and may be Held with One Hand While being Bolted

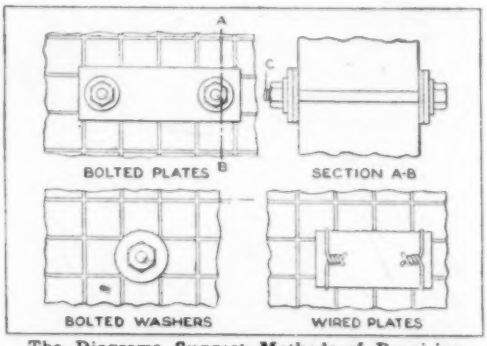
lines is greatly reduced by the use of a pair of tongs, as illustrated. These tongs are made from 5/8-in. round iron and consist of but two integral parts, hinged together as shown. The lower part hooks between the teeth of the lower half of the gear, while the upper part by means of a cross member engages the upper half of the gear after it has been set in position on the axle. It is then only necessary to press down on the handles and the lower half of the gear is raised easily and quickly into position. The halves may then be held in position with one hand while with the other the workman inserts the bolts. The tongs may be constructed with any desired lift by changing the position of the cross arms on the frame.

Iron Surfaces Copperized for Laying Out Work

Copperizing iron or steel surfaces before laying out work for drilling, or machining, enables the workman to distinguish the marks readily. The surface is coated with a solution of blue vitriol and water, applied with a cloth, or sponge. When the liquid evaporates, a copperized surface results. The solution can be conveniently mixed in a considerable quantity, as it can be kept for some weeks if stored in a stopper bottle. The stronger the vitriol solution, the heavier will be the copperized coating, which also prevents rust from accumulating on steel or iron.

Leaky Cellular Auto Radiator Quickly Repaired

When a cellular automobile radiator leaks, a usual way to repair it is to solder the hole with a fine blowpipe torch. If this is not available, the complete cell can be soldered up with a soldering iron, but should neither of these tools be available, as is often the case on the road and elsewhere, the following methods may be used: Obtain two threaded bolts, or rods, long enough to provide about 3/8-in. projection on the sides of the radiator core. Take two pieces of old inner tube, or soft leather, and cut a patch large enough to cover the cell, or cells, that leak. Make two plates of light metal with two holes in them, so that one end of each of the rods projects through, as shown at C. Fit nuts and washers on the rods, and draw them up on the packing to form a tight joint. In the case of a roadside repair, a piece of wire can be used to clamp the covers over the leak, as shown. If only one cell leaks, a single bolt



The Diagrams Suggest Methods of Repairing Leaky Auto Radiators When Soldering Equipment Is Not at Hand

through the center, with a rubber or leather washer, will hold the water, as detailed.—Francis King, Detroit, Michigan.

A Scout Monoplane

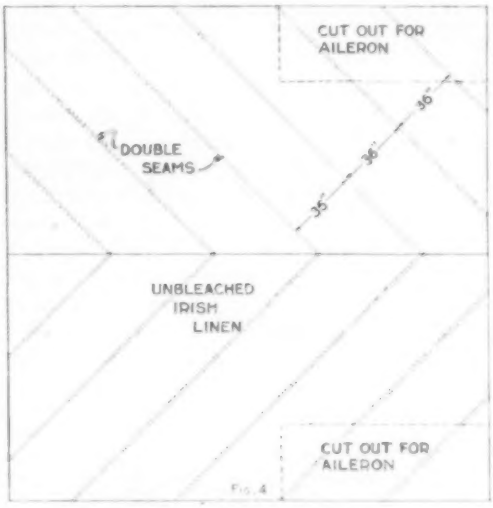
Built in the Home Workshop

by George D. White

THIS article is the second of four on the subject of airplane building that Popular Mechanics Magazine will publish. The first installment, appearing in the May issue, dealt with wing construction. Subsequent chapters will describe the various stages of development with the view of making it possible for men or boys, or groups of boys, of average mechanical ability to construct a successful airplane.—Editor.

Part II—Covering the Wings

FOR covering the wings about 60 yd. of medium-weight unbleached Irish linen will be needed. The cloth should be 36 in. wide and cut into strips, which are sewed as indicated in Fig. 4. In sewing the cloth, heavy linen thread is used, as well as double seams. After sewing into the shape shown, two of the corners are cut out, as indicated by the dotted lines. These will be used for the ailerons. To attach the cloth to the main wings, one edge of the cloth is first tacked to the rear edge of the wing. Tacks, about half the size of carpet tacks, are used and placed about 1 in. apart. After one side has been tacked, the cloth is taken across the wing and tacked tightly to the front edge of the wing, on the front beam. It should be stretched endways, the length of the wing, and tacked into the end ribs. Care must be used to get the cloth tight and eliminate all wrinkles. When the top of the wing is covered tightly, the cloth is taken across the bottom and tacked to the rear edge again, covering up the first row of tacks. The cloth is then stretched endways again and tacked to the end ribs, covering up the first row as before. The tacks along the front beam may then be taken out, as they are now unnecessary. Beginning at the front edge of the wings, rows of tacks are then driven along each rib as far back as the rear beam. These tacks are also placed



The Wing Covering is Sewed and Cut as Indicated Before being Stretched over the Frame Structure. The Covering for the Ailerons is Cut Out and Applied Separately

about an inch apart. After all tacks are in, a strip of ⅜-in. linen tape should be nailed over each row of tacks, using ½-in. flat-head, No. 20 gauge nails. In putting on the tape, one nail should be put near one edge and the next near the opposite edge, instead of a single row down the center of the tape. The ailerons, stabilizer, elevators, and rudder are covered

in the same manner. Little difficulty will be experienced in cutting and sewing the cloth the right size for these.

Doping the Wings

To make the cloth air-tight, the wings must be given a coat of "dope," and since there are several brands of prepared aero dopes, the builder will do well to use one of these rather than try to mix his own. The dope should be carefully spread with a 4-in. brush and with even strokes. After each coat it should be allowed to dry, and is then rubbed smooth with fine sandpaper or mineral wool. The planes should be given three coats of dope. After the third coat has been rubbed smooth, a coat of spar varnish is applied. This is likewise rubbed down smooth, and after drying thoroughly, a second coat of spar varnish is applied.

The wings will then be finished and have a tight, smooth, and glossy surface. Wherever there is a bolt hole through the wings or anything attached, the spot is covered with a piece of tin to take the wear off the cloth. The piece of tin is cut the right size and nailed on top of the cloth with fine nails.

Instructions for covering the wings are given here because at this stage of construction it is more easily followed. The builder, however, should not cover them until the last thing. It is better to build all parts of the monoplane, then attach the wings (as will be explained) and completely assemble the machine before covering the wings. The wings are then detached for covering. This is done for the sake of protecting the cloth, as constant working on the machine with the wings covered would surely result in holes being punched and more or less scuffing of the smooth surface.

The Fuselage

The construction of the fuselage, or body of the monoplane, comes next. To this fuselage is attached the wings and landing gear, and inside the fuselage is located the motor, pilot's seat, and controls. The fuselage is the shape and size shown in the side and top views of Fig. 5. The length from front to rear is 16 ft. 9 in., the depth is 2 ft. 3 in., and the width is 30 in., outside. The four main beams, or longerons, running the entire length, are 1 in. square. They must be bent to conform to the shape of the fuselage.

The two top longerons must be bent only one way or in toward each other. The lower two must be bent in two directions, in toward each other, as the upper ones, and upward at the front. By studying Fig. 5 closely this is readily understood. To bend these parts they must be steamed. Some sort of a long tube, like a tin can, 6 in. in diameter and 12 ft. long, will be necessary. This may be a large pipe or a piece of gutter downspout

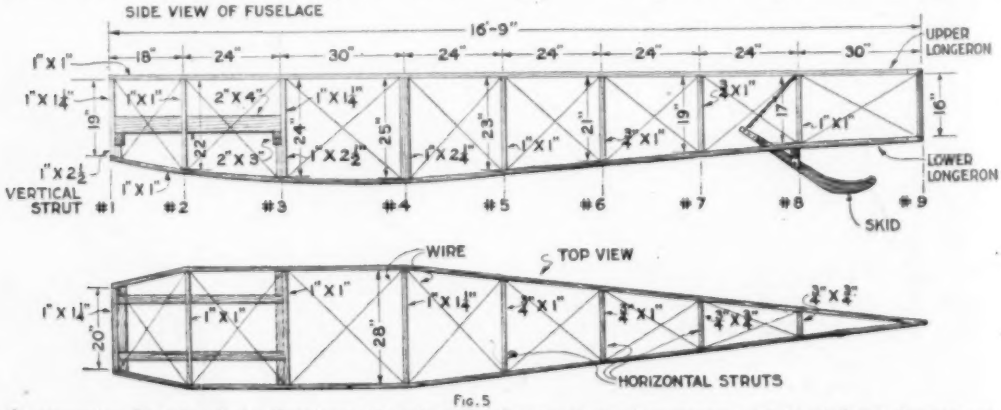


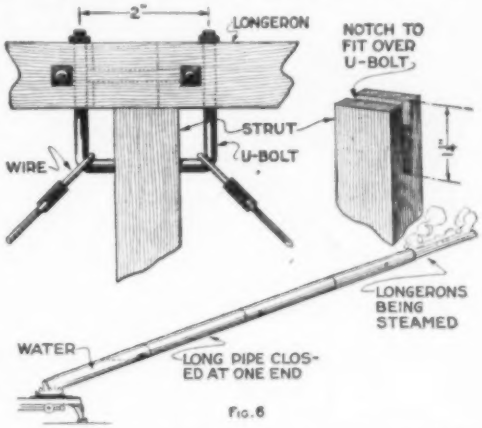
Fig. 5

Construction Details of the Fuselage, Showing the Curves of the Longerons: It Is of Great Importance That the Bends in the Longerons Be Absolutely True. Otherwise the Machine will not Deflect the Air Properly and a "Cranky" Airplane will Be the Result

with one end plugged. Any local tin shop will construct such a tube. The latter method is probably the best. Water to a depth of 2 ft. is put into the tube and the four longerons are then put in it. The water in the tube must boil, so, after inserting the longerons, which will stick out several feet at the top, the bottom end is set on a gas plate or other sort of stove, and brought to a boil and left to steam for three hours. This process is illustrated in Fig. 6. While the parts are steaming, some blocks are nailed on the floor to bend the longerons around. For the lower longerons a block must be nailed to give them the upward slope besides the side bend. After being bent, the longerons should dry for two or three days. In the meantime, the upright and cross struts should be cut. The dimensions of these are given in Fig. 5. These struts are attached to the longerons with U-bolts, and are joined as shown in the detail sketch of Fig. 6. The U-bolts may be purchased, or made from Bessemer-steel rod, bent into shape, and cut the right length. The ends are threaded and fitted with nuts for fastening. After the upright and cross struts are fitted, the fuselage must be braced across each rectangle with No. 12 gauge plated airplane wire. Note that to use the U-bolts, the ends of each strut must be notched as in Fig. 6. The wires attach to the corners of the U-bolts. The method of attaching wire and cable ends is shown in the detail, Fig. 6. The struts are numbered on the drawing of the fuselage. Vertical struts Nos. 2, 3, 4, 5, 6, 7, and 8 are attached with U-bolts. The first strut, No. 1, is fastened with angle irons and bolts, as shown in the lower detail, Fig. 8. The rear strut, No. 9, consists of a steel tube, 1 in. in diameter. The arrangement for attaching is shown in Fig. 8. At the top and bottom square sockets are brazed to the strut and into these the longerons are inserted. Each wire on the fuselage is provided with a turnbuckle. The wires should be stretched as tight as possible. All wood parts should be given two coats of shellac, and all metal fittings should be enameled, to prevent rust.

The Landing Gear

The landing gear of the monoplane consists of two 20 by 4-in. wheels in front, supported by two steel "U's,"



The Longerons are Steamed for Bending by being Placed in a Long Metal Tube Partly Filled with Water and Brought to Boiling. The Upper Sketches Illustrate the Method of Wiring and Attaching the Vertical Struts

and a skid in the rear. The shape and size of the "U's" are indicated in Fig. 7. The tubing should be 3 in. in diameter and of No. 14 gauge thickness. To be bent into shape it will have to be heated. Local motorcycle and bicycle shops, or machine shops, are equipped for doing this work. The top ends of the tubes are made oval, a loop is formed from steel and an eye made, as shown in Fig. 7. The eye, or loop, is made from 1/8-in. steel, 1 in. wide, bent into shape, the ends are inserted in the tube and then the tube is flattened out around it snugly and brazed. The shaping may be done in the workshop, and the brazing by a bicycle shop. The correct angles at the tops of the tubes are given in Fig. 7. To attach the tubes to the fuselage, two fittings, as indicated in Fig. 7, are needed. They are made of 1/8-in. steel and are 1 in. wide. These may be easily bent into shape in a vise. The top of the front leg of each tube will be inserted in the fitting, as shown, and bolted through the loop in the top of the "U" through the fitting. The rear leg of the "U" bolts into the

fitting in the same manner. Near each end of the fittings, they are drilled for

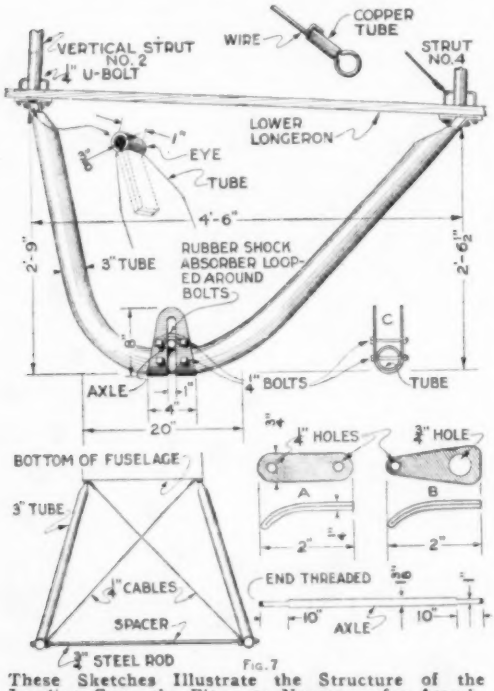


Fig. 7

These Sketches Illustrate the Structure of the Landing Gear, the Fitments Necessary for Attaching to the Body of the Plane, and the Method by Which They are Applied

1/4-in. bolts. Struts Nos. 2 and 4 in the fuselage are fastened with 1/4-in. U-bolts. Where the arms of the U-bolts project through the lower longerons they also project through the fittings. Nuts, drawn up tightly, hold the fittings rigid. By studying Fig. 7 this will be easily understood. Thus, by taking out the four bolts, the two "U's" can be taken off. It is necessary to brace the "U's" sideways, so two 1/4-in. cables are used, one from the right side of the "U's" to the left side of the bottom of the fuselage, and one from the left side of the "U's" to the right side of the fuselage. Two fittings, as shown at A, Fig. 7, are needed. A 1/4-in. hole is drilled in each end, as shown. One end of these fittings will bolt to the bottom of the fuselage using the vertical-strut U-bolt. After attaching these two fittings, the cables are fastened to the opposite ends. Across the bottom of the "U's" a spacer is needed, to keep them from pulling together. This consists of a steel rod, 3/4 in. in diameter, threaded on each end. A thin nut is then screwed on, until 3 1/2 in. of the end of the rod projects outside the nut. A 3/4-in. hole is drilled through the bottom of each "U," and the spacer is inserted in these holes. It will project through 1/2 in. A nut is placed on each end of the rod and it is then rigid. Two fittings, like B, Fig. 7, are needed. These are slipped over the spacer rod before it is put through the holes in the "U's." The cable, previously fastened to the bottom of the fuselage, is fastened to this fitting. With a turnbuckle in each cable the "U's" can be held securely in the correct position, and in case of disarrangement, such as might result from bad landing, they can be quickly readjusted.

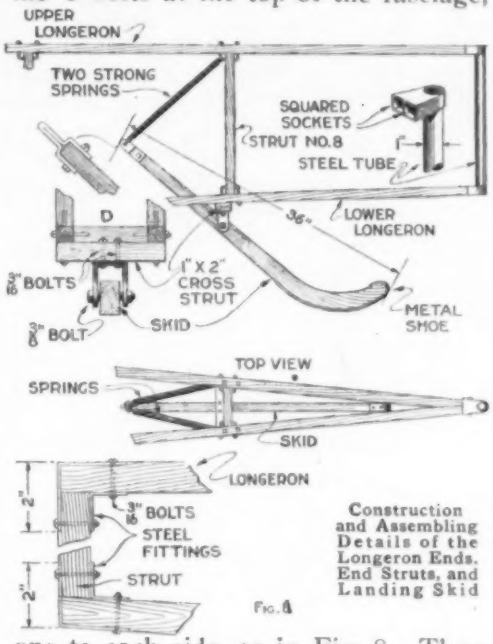
Attaching the Axle

The 20 by 4-in. wheels run on a 1-in. axle. This should be cut 68 in. long, from 1 3/8-in. round steel stock. The ends are turned down for a distance of 10 1/2 in. to 1-in. diameter. The wheels will run on the 1-in. part. The ends of the axle are threaded 1/2 in., with a right and a left-hand thread. The wheels are then put on the axle and after the nuts are put on, they are held securely in place. The axle is attached to the "U's" with rubber shock absorbers. Fig. 7 illustrates the method of application. As will be seen, two fittings, like C, Fig. 7, made of 1/8-in. flat steel, are wrapped around the "U's" and bolted fast with 1/4-in. bolts. Other 1/4-in. bolts are placed through the upper part of the fitting, as in the drawing, and the rubber shock absorbers are looped around them at each end. The axle is merely slung under the rubbers and can spring up and down to take up the shocks of landing, but cannot slide sideways, or otherwise get loose.

Rear-Skid Arrangement

The rear of the fuselage is supported by a small skid, which easily carries the weight and at the same time serves to slow up the machine after landing. The skid is 36 in. long and of the gen-

eral shape shown in Fig. 8. It is made of ash or hickory, is 1 in. square at the top and remains an inch thick throughout, but enlarges until it is 2½ in. wide near the rear. A ⅜-in. hole is drilled in the skid, in the location shown in Fig. 8, through which it is bolted in place as illustrated. The top end of the skid will have a fitting, bolted as shown. This is merely two pieces of steel, bolted with a 3/16-in. bolt, and brought together. A ¼-in. hole is drilled through the fitting at its uppermost end. A band of sheet iron should be wrapped around the skid at the center hole to prevent splitting, and a ⅛-in. piece of flat steel should be screwed to the bottom at the rear where it will drag on the ground, to prevent undue wear. The skid will be located under strut No. 8, as illustrated in Fig. 5. The skid cross brace is 1 in. thick and 2 in. wide, and is bolted directly to the bottom of the fuselage with one leg of the U-bolt, as indicated in Fig. 8. In the center of this strut a fitting is bolted, as at D, Fig. 8. A ⅜-in. bolt goes through this fitting and through the ⅜-in. hole in the skid, allowing the skid to pivot. Two coil springs, ¾ in. in diameter, are then hooked into the upper end fitting of the skid. The opposite ends will then be hooked into the arms of the U-bolts at the top of the fuselage,



Construction and Assembling Details of the Longeron Ends, End Struts, and Landing Skid

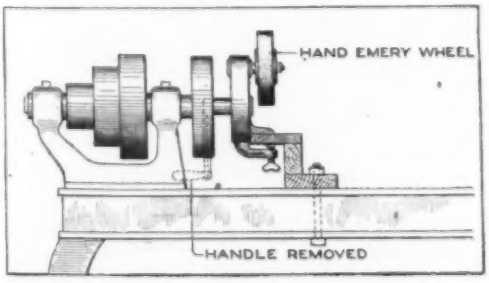
Fig. 4

one to each side, as in Fig. 8. These springs allow for the shock of landing, and also take up any side play. After the landing gear is attached, the fuselage may be stood up and the motor bed, wing-attachment fittings, and other details installed, as will be told in the next article.

(To be Continued)

Small Emery Grinder Converted into Power Machine in Lathe

Having a lot of grinding to do and being without a power grinder, I recently faced the prospect of sending the grinding job out or buying a power grinder. Either alternative meant considerable expense. I had a small hand grinder and decided to solve the difficulty by finding a way of applying power to it. The sketch indicates how the purpose was accomplished. A block was constructed and bolted to the bed of the lathe, as indicated. The handle was removed from the grinder, and the end of the shaft clamped in the lathe chuck. In this position the little machine gave satisfactory service.—L. M. Phelps, Philadelphia, Pa.

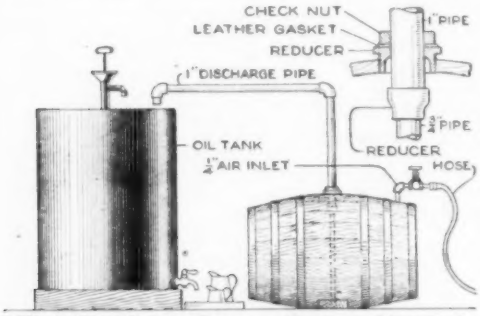


By Fastening a Small Hand Grinder in a Power Lathe, the Expense of Buying a Power Machine, or Sending the Grinding Job Out, was Eliminated

¶If a tracing becomes worn from erasures, causing the ink to spread, trace the lines on the reverse side at the worn spot.

Oil Discharged by Pressure Eliminates Lifting Barrel

In garages and shops where oil of any kind is used by the barrel, a great deal of back-breaking labor is elimi-



With This Simple Pressure Device a Barrel of Oil is Transferred to a Reservoir with No Other Effort Than Rolling the Barrel

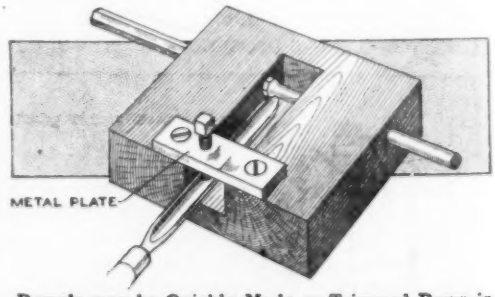
nated by providing a pressure-discharging device, as shown in the sketch. The discharge-pipe reducing bushing is screwed into the bunghole of the barrel to insure an air-tight fit. The air-inlet pipe is also screwed in, as shown. With 50-lb. air pressure in the hose, a 50-gal. barrel is emptied in a few minutes. If the outlet pipe is fitted to within 1/4 in. of the bottom of the barrel the last drop of oil will be forced out.—Samuel C. Carter, Detroit, Mich.

Blasting Soot from Factory Smokestacks

Smokestacks that are clogged with soot are wasteful of fuel. A quick and economical method of cleaning them is by exploding a charge of blasting powder within the stack, thereby creating a concussion which jars loose and brings down all soot deposits on the walls. For this purpose a gun is used. It is made from a piece of pipe shafting, 4 in. in diameter and 16 in. in length. A hole, 1 3/4 in. in diameter, is bored in one end to a depth of 10 in., converting it into a small cannon. A 1/4-in. hole is bored in the side near the base of the longitudinal hole to accommodate a fuse. The cannon is loaded with an 8-in. charge of blasting powder, wadded securely with paper and clay, and is fired after being placed with its muzzle upward in the base of the flue. This charge is usually sufficient to loosen the soot in a chimney 100 ft. high and 4 ft. in diameter. A larger flue, or one that is badly sooted, may require several shots, or the size of the cannon and the charge of explosive used may be increased to meet the requirements. Much time is saved by this method of cleaning. With careful handling there should be no occasion for an accident and no danger whatever of injuring the stack.

A Dowel Cutter for the Home Workshop

In woodworking, wooden dowels frequently must be of a special size. The homemade cutter illustrated is thoroughly useful, both for making dowels and cutting down those which happen to be oversize. A hardwood block, about 2 by 2 by 3 in., has, near the center of one end, a hole bored the size of the dowel. On the other end a hole is bored large enough to permit the uncut part of the stick to pass through freely. On the middle of one side of the block a slot is cut, as indicated. This slot is large enough to permit a ground gouge to fit into it. The cutting edge of the gouge must center with the dowel to be cut. Over this slot is fastened a metal plate with a wood screw passing through it, to hold the gouge in proper adjustment. A strip



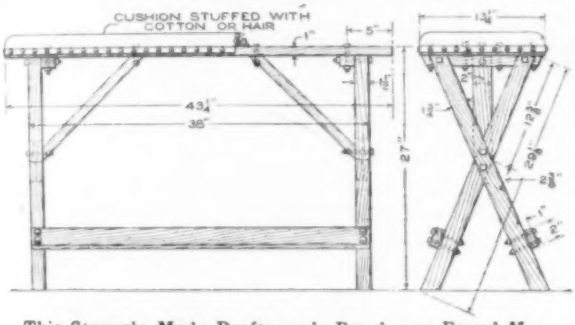
Dowels may be Quickly Made or Trimmed Down in the Home Workshop with the Aid of This Simple Cutter

of maple, or other hard wood, is sawed to a hexagon slightly larger than the

dowel wanted. One end is then placed in the headstock of the lathe, and while revolving, the cutter is held by hand and started at the other end. By feeding the cutter slowly a smooth, accurate dowel is made.—Arthur A. Richardson, Center Barnstead, N. H.

Convenient Bench for Use at Drafting Table

Many draftsmen find the ordinary high stool uncomfortable and inconvenient, especially when working on a long sheet. After considerable experimenting in a large drafting room, benches of the type shown in the illustration were found to overcome both objections to the high stool. It is strongly constructed, as shown, the joints being bolted wherever possible.

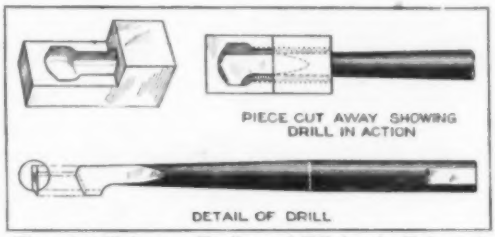


This Strongly Made Draftsman's Bench was Found More Convenient Than the High Stools Commonly Used

The padded cushion, of strong, smooth cloth, is an especially good feature, and the foot rests also provide stout braces. Oak and maple are good woods from which to make the bench, and can be finished easily to match other furniture.

Drill for Enlarging the Bottom of Threaded Holes

The drill illustrated is ground from a piece of tool steel to the shape and size required for the work in hand. After this type of drill has been used, bottoming taps will be found unnecessary. It also permits enlarging the bottom of the hole without the slightest danger to the threaded walls. In a hole thus bottomed, the stud may be screwed in firmly, as there is vacant space all around its end, and once



Threaded Holes are Easily and Efficiently Enlarged at the Bottom by the Use of This Simple Tool

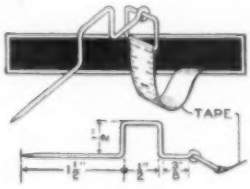
sent home it will have little tendency to back out.—M. L. Lowrey, Livermore, Calif.

Paraffin for Woodworking Tools

Paraffin is a desirable lubricant for tools used on woodwork, because it is clean, leaves no stains or marks on the wood, and stays on the tools longer than oil or grease. It is easier to apply, being simply rubbed on, can be carried unwrapped and unprotected in the pocket, and is more economical than oil. One-third of the tablet commonly sold fits the hand and the pocket. For rabbet and plow work, paraffin is especially handy. It sticks to the wooden surfaces of tools used in such work, and if a little is rubbed occasionally along the sides of the rabbet or plow, the plane works easier.

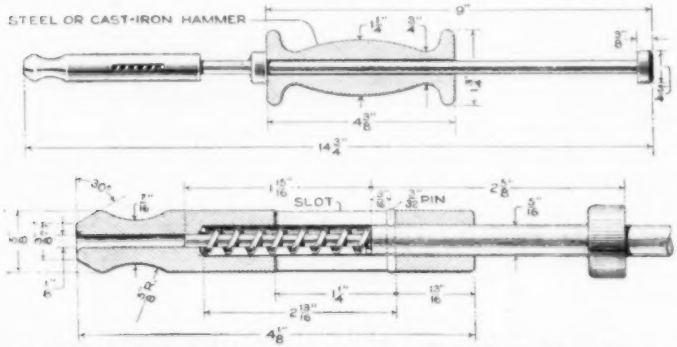
Quick-Releasing Tapeline Holder does Not Snag Readily

By bending a piece of No. 10 gauge wire to the form shown, a helpful hook-and-pin tapeline anchor is provided for single-handed work. It may be made fast almost anywhere and released by simply whipping the line. When the tape is reeled in, the hook does not snag in weeds or grass.



Handy Tool Drives Small Nails into Hard Wood

Driving small nails in hard wood is difficult because, if the utmost care is not used, they will bend rather than enter the wood. The homemade tool illustrated overcomes this difficulty by holding the nail so that it cannot bend while driving it home or into the wood at an angle. There are but four principal parts to the tool, and these are of the shapes and dimensions indicated in the sketch. All are made of shaft steel, with the exception of the sliding hammer, which may be of cast iron. The end of the driving rod is hardened and magnetized for picking up the nails. The upper end of the rod is threaded, and the cap is screwed on and pinned in place after the hammer has been mounted. The nail tube is hollowed out, as shown, and provided with a coil spring to accomplish the rebounding of the driving rod after each blow is struck. The nails are placed, one at a time, in the nail tube, which is then set over the spot where the nail is to be driven. A few blows with the hammer finishes the task. Even the most slender nails may be driven into the hardest wood without danger of bending.



Small Finishing Nails are Quickly Driven into Hard Wood without Danger of Bending, with the Aid of This Simple Homemade Tool

Easy Method of Removing Foreign Particles from the Eye

The removal of foreign substances from the eye is difficult when the hands are smeared with grease or other stains of shop work. Under such circumstances the desired result is frequently accomplished by immersing the eye in a basin of clean, warm water and then blinking rapidly half a dozen times. Unless the particle has actually been imbedded in the eyeball or lids this procedure will usually wash it out or into the corner of the eye, where its removal becomes easy.—T. J. Grogan, Atlanta, Georgia.

Round Recesses Easily Cut with Homemade Tool

The legs of furniture fitted with casters are less liable to split if the caster stems are fitted into short lengths of gas pipe of the proper diameter and recessed into the wood. To make the pipes fit, recesses should be cut in the ends of the legs with a cutter made from a piece of the same pipe. The tool should be 6 in. in length and provided with a row of teeth on one end. After sharpening the teeth, which may be done with a file, that end should be tempered slightly. A hole is then drilled through the other end for the insertion of a rod to serve as a cross handle. Quick and thoroughly accurate work is accomplished with this tool, and the holes thus made are the correct size to take the pipe, insuring a perfect driven fit.—Frank L. Matter, Portland, Ore.

Simple Test to Distinguish Wood Alcohol from Denatured Alcohol

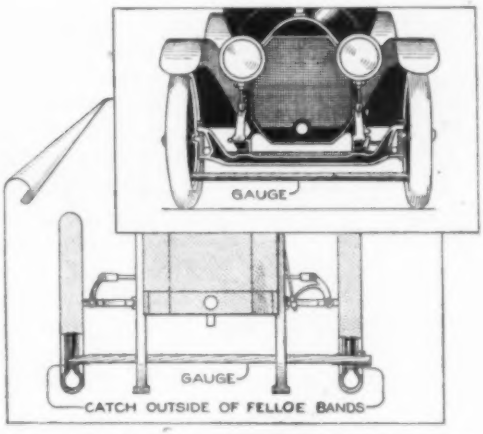
It is often difficult to tell the difference between refined poisonous wood alcohol and denatured alcohol. A thin piece of celluloid, if put in a vial of the alcohol in question, will quickly reveal its nature. Wood alcohol will dissolve the celluloid, while denatured alcohol will have no other effect in 12 hours than to remove the polish. In handling these chemicals it should be borne in mind that wood alcohol is not only a deadly poison if taken internally, but that one may be poisoned by breathing its fumes, or by absorption through the skin.

Old Files Made Serviceable by Treating with Acid

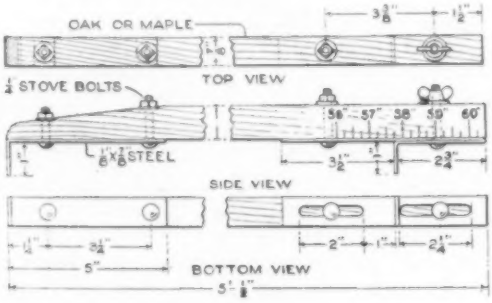
Files that have been worn until they are no longer fit for use may be made to render additional service by soaking them for 48 hours in a weak solution of sulphuric acid. The worn teeth are corroded so that numerous sharp cutting edges remain. When using sulphuric acid it should be remembered that it is poisonous and corrosive, and should be handled with great care.—Earl E. Brown, Coffeyville, Kan.

Gauge Stick Useful for Alining Automobile Wheels

In alining automobile wheels, either in assembling or in making repairs, a gauge stick, as illustrated, is of material aid in procuring the accuracy essential to obtain maximum tire mileage. Guesswork wheel alinements are usually costly experiments. The stick is best constructed from a piece of maple or other good, clear wood. It should be 5½ ft. long, 1 in. wide, and ⅞ in. in thickness. The end fitments are made from ⅛-in. band-iron stock.



In Use, One End of the Gauge Stick is Hooked over One of the Rims While the Measurements are Taken on the Opposite Wheel



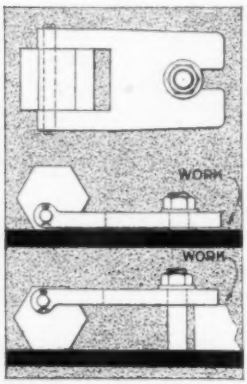
Construction Details of the Automobile Wheel Alining Gauge Stick

Method of Planing Chair Cane

When recaning a worn-out chair seat it often happens that one wishes to reduce the size of one or more of the strands of cane. This may be satisfactorily accomplished by guiding the cane against a plane bit with a large darning needle. The plane is placed, bottom side up, in a vise. The eye of the needle is then thrust upward through the throat of the plane and the cane threaded into it. By pulling the cane through the eye and across the cutting edge with one hand and pressing it squarely against the plane bottom by means of the needle with the other hand, a fine uniform shaving may be removed. Besides reducing the size, this treatment eliminates rough edges and splinters and corrects variations in width. Smoother, neater work is thus obtained.—T. A. Reynolds, Monroe, Wis.

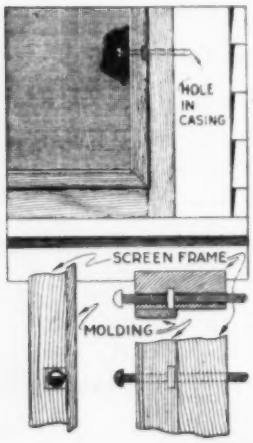
An Adjustable Clamping Device for the Machine Shop

The clamp illustrated is an economical one that may be constructed by any mechanic. It is especially convenient for securing work on a planer, shaper, on the faceplate of a boring machine, or a lathe. The pin is so located in the blocking as to give a different distance to each face. As the height is also changed by turning the whole thing over, as shown in the sketch, twelve different heights may be secured.—G. M. M., Woonsocket, R. I.



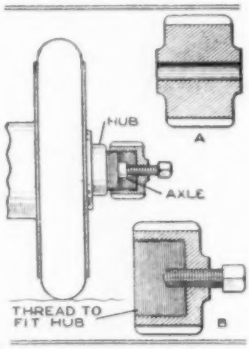
Fastening Fly Screens in Sashes with Stove Bolts

A substantial yet readily removable fastening for fly screens in window sashes is made by setting stove bolts in the screen frames, as shown in the sketch. A square hole of the size and shape of the nut used with the stove bolts is chiseled into the side of the screen frame. The hole is then drilled in the center of the square depression for the passage of the bolt. A similar hole is made for the bolt in the window casing. A touch of white lead, or putty, may be applied to the nut socket in the screen frame to hold the nut securely after it is pressed in. The screen is then set in place and the bolt turned home with a screwdriver. Two bolts so applied in the middle of the two sides of the screen frame are usually sufficient to hold it against the rigors of the most severe summer storms.



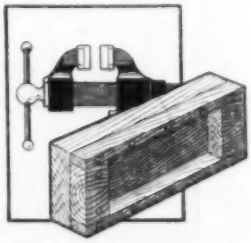
Device for Removing Automobile Wheels from Axle

The illustration shows how I made an excellent wheel puller from an old reverse gear which I found in the junk pile of my garage. The drawing, at A, shows the shape of the gear in section. I bored out and threaded the inside, as shown at B, making the thread of the same size as that on the wheel hubs. I then tapped the hole in the gear and provided a strong hexagonal machine bolt. To remove a wheel, turn the puller onto the hub; give the machine bolt a few turns with the aid of a large wrench, and the wheel is removed readily.—K. L. Adler, Boston, Mass.



Wooden Caps Convert Machinist's Vise into Bench Clamp

In most carpenter shops a machinist's vise is provided, and it is often desirable to use this for finishing small pieces that are difficult to hold in an ordinary bench vise. By providing the machinist's vise with wooden caps, as illustrated, work may be clamped securely without marring it. A pair of such caps may be quickly made from waste material. Any good hard wood will



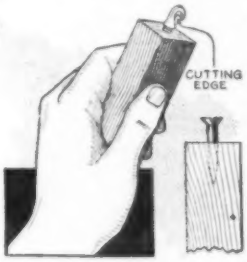
do. The finished caps should be lined with leather to prevent splitting of the wood, and to provide the slight resiliency necessary.

Acid-Proof Cement for Pipe Fittings

An excellent cement for packing the joints of piping or vessels containing strong acid solutions is made by mixing equal parts of asbestos fiber, linseed oil, and white lead. For weak acids the cement may be cheapened by the addition of clay.—J. J. O'Brien, Buffalo, N. Y.

Handy Twine Cutter Made from a Wood Screw

By heating and flattening the head of a large wood screw, driving it into a block of wood of a convenient size to serve as a handle, and filing the head as illustrated, an excellent twine-cutting tool is produced. Such a device may be contrived in about five minutes, and for use about a shipping room or other place where twine is used it is invaluable. Any twine, from ordinary wrapping cord to a carpenter's chalk line, is instantly severed by jerking it against the cutting edge.—George W. Smith, Chicago, Illinois.

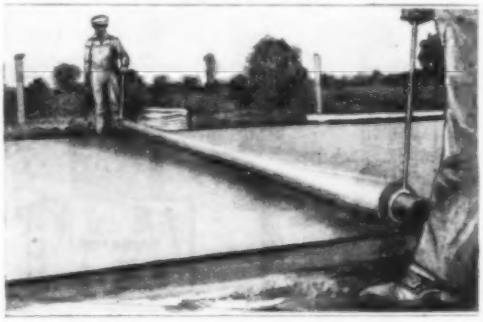


Emergency Corrugated Fasteners for Use in Woodwork

Splendid corrugated fasteners for locking boards together may be made by running strips of heavy-gauge tin, copper, or other sheet metal, through a pair of meshed gears and cutting the wrinkled strips into the desired lengths. Upon the size of the gears will depend the size of the fasteners. This operation will in no way injure the gears.—H. W. Offins, Grants Pass, Ore.

Wooden Roller Aids Construction of Concrete Highways

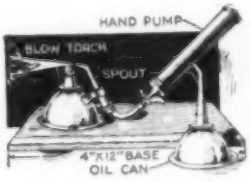
A concrete-road roller of the type illustrated is easily made and is of inestimable value because it gives the desired drainage pitch to the center of the highway with a single rolling operation. The roller shown was used in the construction of a cantonment highway, 18 ft. wide. It was turned from a piece of yellow pine, 8 in. square and 20 ft. in length. A dowel, 1 ft. long, was turned on each end, and over each an iron handle was fitted, for convenience in handling the roller while molding the highway.—Frank Yocum, Reading, Pa.



The Roller Tapers to a Smaller Diameter near the Middle, and Thus Automatically Rolls a Concrete Road to the Correct Pitch for Drainage

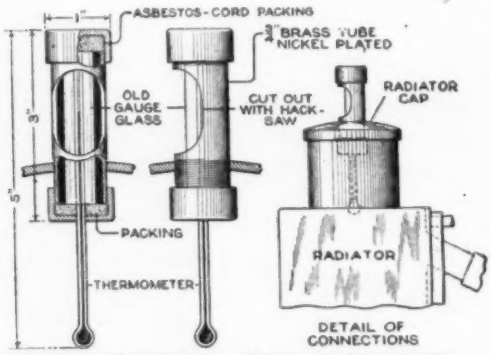
Blowtorch Made of an Oilcan and a Bicycle Pump

A handy blowtorch for light soldering and heating may be made by combining parts of an oilcan and a bicycle pump, as indicated in the sketch. The spout of the oilcan is cut off and soldered to the body to form an air nozzle directed just above a wick inserted in the neck. A piece of air hose is used to connect the pump with the air spout, after which the whole is mounted on a 4 by 12-in. wooden base, by means of screws passing through an extension soldered to the bottom of the oilcan.



Thermometer for Water-Cooling System of Motor Car

In making a temperature gauge for a motor-car radiator, a short piece of

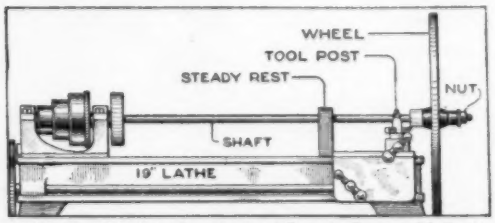


Warning of an Overheated Motor is Given by This Easily Made Temperature Gauge Screwed in the Cap of an Automobile Radiator

3/4-in. nickelplated brass pipe may be used. The threads at the bottom are extended for about 3/4 in. and above them a suitable opening is cut with a hacksaw. The top is stuffed with packing, capped, and the pipe screwed through a hole bored in the center of the radiator cap. The instrument is completed by fitting a gauge glass inside the tube, inserting a thermometer, placing the necessary packing, and tightening the lower cap, drilled in the middle of which is an aperture of slightly greater diameter than the thermometer.—P. P. Avery, Garfield, N. J.

Turning a Fifty-Four-Inch Wheel on a Nineteen-Inch Lathe

Having some machining to do on the hubs of several vehicle wheels that

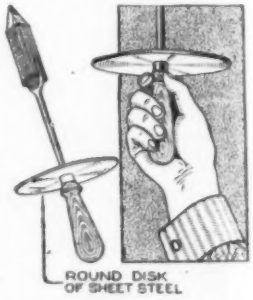


With the Aid of an Improvised Steady Rest, a 54-Inch Wheel was Machined in an Ordinary Shop Lathe

were 54 in. in diameter and only a 19-in. lathe to work on, I accomplished the task as shown in the sketch. A piece of 2-in. shafting, 10 ft. long and tapered at the end to fit into the hub, was fastened in the lathe by the use of a steady rest, as indicated. A nut held the wheel on the end of the shaft, and the tool rest was moved to the extreme end of the bed, where the hub was machined with no difficulty greater than an occasional application of oil to the bearing of the steady rest. —John S. Williams, Aurora, Ind.

Soldering-Iron Shield Protects Hand from Dripping Solder

For overhead soldering operations a heavy leather glove does not always prevent being burned by the drops of solder that may fall from an overheated or improperly tinned copper. A metal-disk shield, fitted on the stem of the tool as illustrated, offers complete protection against dripping



solder as well as from heat radiated by the iron. The disk should be fitted against a small shoulder turned on the stem and the stem threaded to screw into the handle. This permits quick removal of the disk for carrying in the tool kit, or for work where it would not be needed.—C. C. Spreen, Flint, Mich.

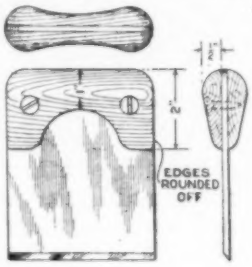
Easy Method of Connecting Sections of Pipe

Connecting two courses of pipe, or stack, having lapped joints, is often a difficult task. By blocking up the courses of the joint, leaving the outer edge of the section resting on the floor, bolting the sections at the bottom of the joint, and then removing the blocking, the work is simplified. The weight of the pipe will force the upper parts toward each other if the inner sections

are tapped lightly with a soft hammer. Drift pins are also used to aid in pulling the courses together.—W. H. Thomas, Davenport, Ia.

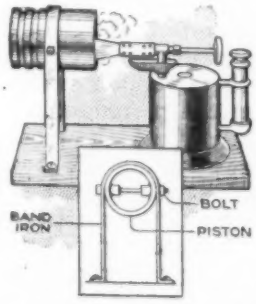
A Convenient Homemade Scraper Handle

Scraping is always hard work when carried on in the usual fashion of grasping the bare, sharp-cornered blade. There are numerous commercial scraper handles, but most of them have the objection of hampering nicety of control. The scraper handle illustrated, while giving a comfortable handhold, also reduces the effort of scraping. It is made from two pieces of ½-in. hard wood, preferably apple or rosewood. The outline is first cut with a coping saw. Then the curves are worked with a rasp and file. Holes are drilled through the blade to accommodate the two screws, which are countersunk and hold the halves of the handle.



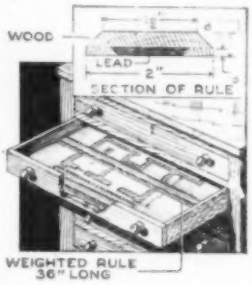
Worn-Out Piston Used as Blowtorch Furnace

When small parts must be heated for tempering, some sort of a heat-retaining furnace is essential if the heat is to be properly distributed and the temper uniformly applied. A simple furnace for such use is made by mounting an old cast-iron piston, as shown in the sketch, and using a blowtorch to direct the heat into the open end. With this arrangement thoroughly efficient heating and tempering is easily accomplished.



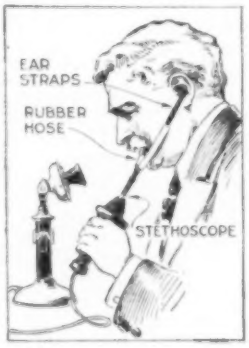
Weighted Rulers Keep Drawings from Rolling When in Use

To a large extent the trouble encountered by draftsmen in keeping drawings, that have once been rolled, from curling when spread on tables, may be overcome by using weighted rulers. Made of hard wood in the manner illustrated, and covered on the bottom with dark felt, they serve satisfactorily. If the rulers are placed on drawings in filing cabinets, they enable crowded drawers to be opened without disturbing the contents.



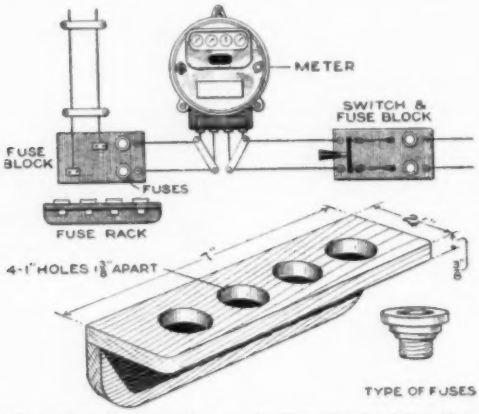
Stethoscope for Telephone and Automobile Use

Difficulty of hearing over a telephone may be eliminated and loose bearings in internal - combustion motors are quickly located by the use of a physician's stethoscope. Many such instruments of slightly antiquated models are obtainable for a nominal sum, and for mechanical service are quite as good as new ones. For the telephone, the diaphragm is fitted to the receiver. This enables one to hear perfectly, regardless of noises in the immediate vicinity. In locating mechanical irregularities about machinery, the diaphragm is placed against the machine and by listening through the ear tubes the position of the trouble is quickly determined.—F. Ball Pinkus, La Crescenta, Calif.



Rack near Fuse Block Holds Fuses for Emergency

When an entire plant is plunged in darkness by the burning out of a fuse,

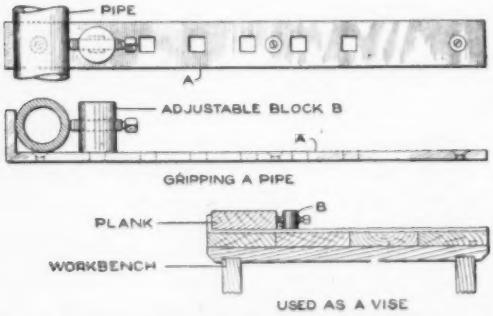


The Spare-Fuse Rack may be Contrived with a Few Minutes' Work, and Much Inconvenience and Vexing Delays will be Avoided

it is decidedly inconvenient and even dangerous for one to go fumbling about to find a spare fuse. This is an annoyance that is eliminated for all time by the installation of a fuse holder, as shown in the sketch. With the spare fuses so located, a burned-out one may be replaced by the light of a single match.

Handy Vise or Wrench Tool for Bench Use

A tool that will be found useful for many purposes about the small shop



For Gripping Round Objects of Either Wood or Metal and Holding Them Securely on the Workbench, This Simple and Readily Adjustable Tool Is Useful

is the simple vise combination illustrated. The body of the tool consists of a flat bar of steel, A, which is bent up at a right angle at one end. In this bar a number of holes are drilled, 1 in. apart. The holes are then squared, and into them a block, B, with a setscrew, as shown, is fitted. In use the piece of pipe, shafting, or other material to be worked upon is placed against the angular end of the bar. The lug is then set in whatever hole is most convenient, and the setscrew is tightened down on the object.—Samuel H. Frankenberg, Pawtucket, R. I.

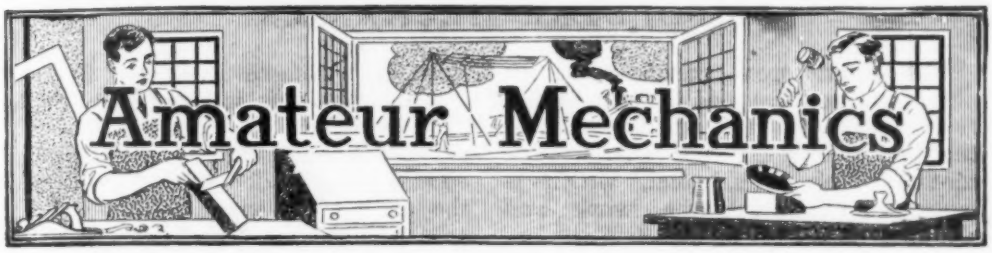
Prolonging the Life of Hammer Handles

The life of a hammer handle may be prolonged if the wedges and head are removed and the end soaked in linseed oil. The end should be placed in the oil and allowed to remain for three or four days. It should then be removed, wiped off, and allowed to dry for a week before the head and wedges are replaced. The resulting toughness and "life" imparted to the handle will be surprising.—Henry Simon, Laguna Beach, Calif.

Cutting Disks or Rings Accurately from Sheet Metal

It is difficult to hold a piece of sheet metal to the faceplate of a lathe without boring holes in it. This is a difficulty that may be readily overcome by proceeding as follows: Warm the piece of sheet metal slightly and place upon it a piece of paraffin, sufficient to spread out and cover the surface when melted. Remove the faceplate and set it, face down, upon the paraffined surface of the metal. When the metal becomes cold the paraffin will have hardened and will be held against the faceplate firmly enough to permit very accurate cutting of disks or rings if care is used.—J. Garrett Kemp, Stillwater, Okla.

¶ Handles on machinery are usually set so that a clockwise movement actuates the part controlled forward, and the reverse, backward.

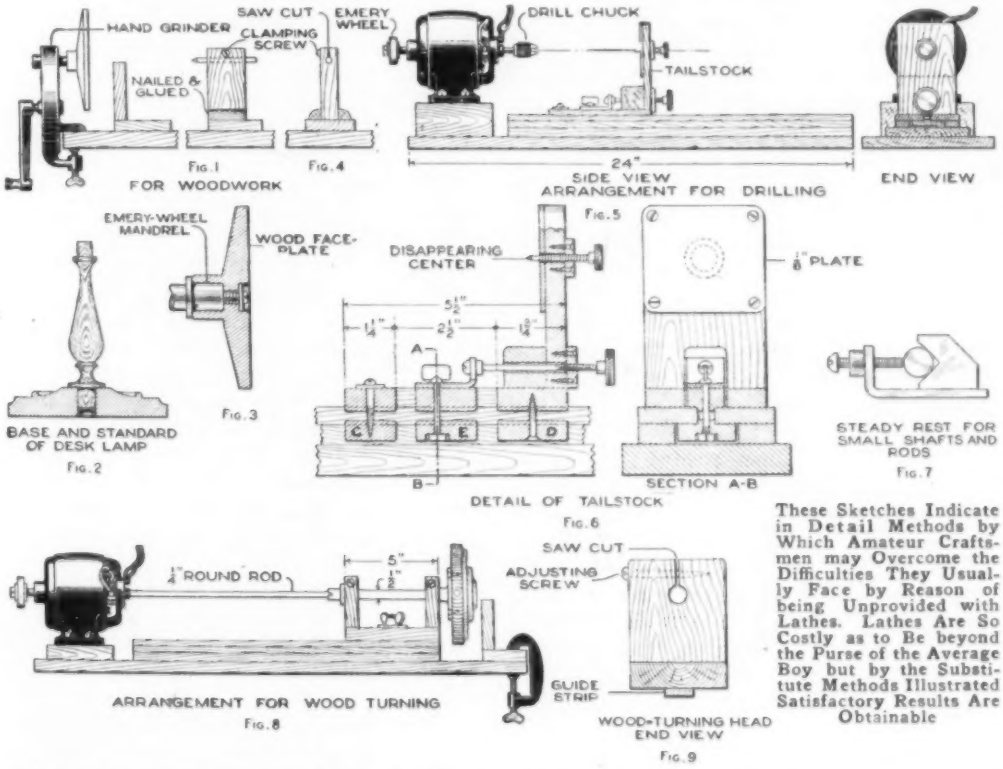


Amateur Solutions of the Lathe Problem

By JOHN D. ADAMS

THE average amateur mechanic seldom has sufficient turning to warrant the purchase of a lathe. Yet, there are many operations that demand rotary motion. It is difficult to properly point a small rod or even polish a screwhead without it.

For woodwork much may be done with a hand grinder, arranged as shown in Fig. 1. By this method the writer has turned the base and standard of the small desk lamp illustrated in Fig. 2. The crank was operated with one hand, and the chisel held with the other. With an assistant to supply the power much more complicated work would be possible. A wooden faceplate that can be readily slipped on in place of the emery wheel, as in Fig. 3, is useful. The diameter, thickness, etc., will have to be adapted to the grinder at hand. By removing the screw in the center, the faceplate is removed. The disk is sawed out with the coping saw, then the edge is glued onto the hub, and trued up. In attaching work to the faceplate, three or four slender screws, set in from behind, are used.



These Sketches Indicate in Detail Methods by Which Amateur Craftsmen may Overcome the Difficulties They Usually Face by Reason of being Unprovided with Lathes. Lathes Are So Costly as to Be beyond the Purse of the Average Boy but by the Substitute Methods Illustrated Satisfactory Results Are Obtainable

The steady rest consists of two pieces of wood fastened at right angles. It is set in position on the edge of the bench and clamped there. The center is of 1/4-in. steel, which is tapped up against the work and clamped, as shown in Fig. 4.

For metal work the writer has adapted a 1/20-hp. grinding outfit. The motor has a grinding wheel on one end and a drill chuck on the other. This is screwed at one end of a 3/4-in. board, 2 ft. long, as shown in Fig. 5. The guides are built as illustrated, the top strips being of hard wood, 3/8 by 1 1/2 in. All are fastened to the base with glue and nails, after which the top surface is sanded into alinement.

In the construction of the tailstock, a wooden angle is built up of 1/2-in. material reinforced with a corner block, securely fastened with glue and four screws. In the center of the piece that rests on the lathe bed is a rectangular opening, 1 by 2 1/2 in., for the reception of the block that serves to clamp the tailstock on the bed. To keep the tailstock parallel with the guides, a thin strip is glued to the underside at each end so as to travel smoothly along the central slot in the bed. Three small hardwood blocks are next prepared. These travel underneath the tailstock in the space below the guides and are indicated in the detail of the tailstock, Fig. 6. Each of the blocks is fastened to the tailstock with a wood screw. Block E is used for clamping, and has a small nut set in its underside to engage a machine screw, let down from above and provided with a piece of sheet brass, soldered to it to form a wing nut. When the tailstock is clamped in position it may be moved forward by means of the screw shown in the detail. The three blocks C, D, and E each have a thin strip glued to the upper side to engage the slot between the guides, keeping them from traveling sideways.

It is advisable to cover the face of the tailstock with a piece of 1/8-in. metal plate, and if a hole is drilled in the middle, a small pointed center may be arranged to screw forward. For drilling, this is screwed back out of the way.

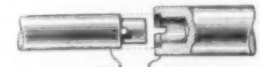
If slender rods are handled, the rest should be provided with a holder for the end of the work. This is made as shown in Fig. 7. Bend a piece of strip brass to a right angle, and solder a dry-cell nut to one leg. Directly opposite solder a piece of steel having a right-angle notch. If the center of the screw and the notch are set the same height above the bed as the center of the chuck, a slight adjustment sideways will accommodate any size of shaft. When the work is in place apply a little oil to the notch. It is then a simple matter to point, or make a shoulder on, the end of a small shaft with a file.

For woodwork a separate turning head should be made, as indicated in Figs. 8 and 9. The bearing uprights should be of hard wood. The clamping and guide strips are arranged as in the tailstock. The best way to drill the bearing holes is to place the head on the guides, and, with a 1/4-in. drill in the chuck, push the wood against the drill. Turn the other bearing toward the chuck and make a 1/4-in. hole in it also. Next get a 1/4-in. rod, about 1 ft. long, and drill a 3/32-in. hole through, about 5 in. from one end. Solder a piece of steel, 1/2 in. from the end of the drill used to make the little hole, in this hole, and file the sides of the projecting ends to form cutting faces. Chuck one end of the rod, slide the turning head along the guides until the 1/4-in. rod passes through both of the holes previously bored in it. By pushing the turning head farther toward the chuck, a test should be made to see if the boring bar is making the proper size of hole. If not, a few strokes with the file will bring it down to size, after which the turning head is pushed against the cutter until all but 1/8 in. of the bearing has been bored out. Turn the head around on the guides and proceed with the other end as before.

The spindle, as shown in Fig. 10, should have a flange on the forward

end, so the wood to be turned may be screwed thereto. A hardwood faceplate may be built up on the end of the spindle, which should project 1 in. beyond the bearing. When the wood is forced in place, run a 1/8-in. hole clear through for a pin.

The driving is accomplished by means of a 1/4-in. rod turned down on one end to engage a hole in the end of the spindle. A small projecting pin near the end of the rod engages a slot in the spindle, and the other end of the rod is chucked. In this way a flexible drive is secured without endangering the motor shaft or chuck.



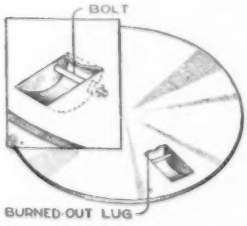
METHOD OF DRIVING

An Inexpensive Box for Testing Seeds

A satisfactory seed-testing box for laboratory or classroom use may be made from a cigar box and an egg-case filler. The latter is cut the correct size and fitted into the cigar box. The compartments thus formed are filled with seed and the test numbers written on the filler cells.

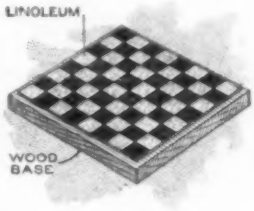
Repair for a Burned-Out Stove Lid

Because stove lids are usually very thin near the point where the lifter takes hold, it is here that they ordinarily burn out, or break off. Having had this experience and finding new lids costly, I effected the repair shown in the sketch. The lid was placed in a vise and a hole drilled through the walls of the lifter socket. Then a long stove bolt was inserted and fastened with a nut. This furnished an anchorage for the lifter and made the lid as good as new. —Mervyn Hale, Beaver Falls, Pa.



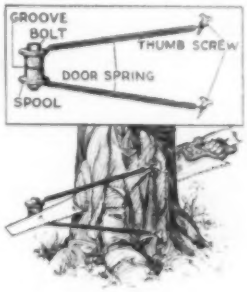
Checkerboards for Soldiers and Sailors

Soldiers in a United States Army cantonment have solved the problem of securing cheap checkerboards by tacking a piece of checkered linoleum upon a block of wood, or the top of the table on which the game is played. Thoroughly satisfactory checkers were made by sawing off sections of an old broom handle. Half of the "men" thus made were dipped in ink to distinguish them from the opposing force. In the navy these broom-handle checkers may be used on a board chalked on the deck.—Richard J. Worthington, Jacksonville, Fla.



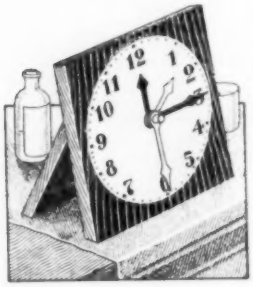
Spring Attachment for Saws Aids in Felling Trees

When felling a tree single-handed with a large crosscut saw rapid work may be accomplished by the use of a coil-spring saw-tension device, as shown in the sketch. It consists of a large hardwood spool notched in the middle to ride the back of the saw blade. A bolt is passed through the spool and to the two ends two screen-door springs are secured. The other ends of the springs are fastened to thumbscrews, set into the tree in such a position as to obtain the correct tension of the springs. In this way the end of the saw is drawn down securely against the work so that one man may make a cut through a trunk with nearly the same speed as if two men operated the saw.—Dale R. Van Horn, North Loup, Neb.



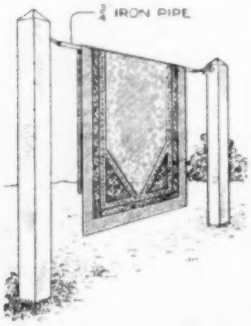
Sick-Room Indicator Tells Time for Medicines

When giving a patient two or more kinds of medicine at specified times, it is difficult to comply with the physician's orders if one must depend upon memory. Possibility of confusion may be eliminated by the use of the double - handed clock dial illustrated. The dial is painted upon a piece of 5 by 6-in. board and supported in an upright position, as shown. Two sets of hands are cut from two different colors of cardboard, each color to represent one kind of medicine. A piece of each cardboard is then placed under the edge of the vessel in which the medicine is kept for the purpose of identifying it. Each time the medicine is given, the hands are turned up to indicate when it will again be time for that particular dose. As many pairs of hands may be provided as there are kinds of medicines.—F. E. Brimmer, Dalton, N. Y.



Nonsagging Hanger for Beating Rugs and Carpets

In communities where the beating of rugs and carpets is not illegal, the method of hanging them on the line illustrated in the sketch is useful. The line is passed through a length of ¾-in. pipe, and the rug or carpet is thus held in a horizontal position across the middle. When so held, the beating becomes less difficult and more effective.—R. O. Helwig, Chicago, Ill.

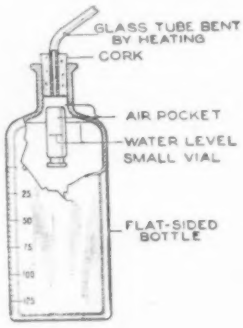


Roasting Potatoes Satisfactorily in the Camp Fire

If potatoes are rolled in a cone of asbestos for baking in the camp fire, it will be found that they will roast much more evenly and will not be charred or smoked on the outside as when placed in the coals without protection. The potato is placed in the cone, which is kept from unrolling by twisting a piece of wire about it to close the open end. —Margaret Conn Rhoads, Boone, Ia.

Calibrated Lung Tester Affords Amusement

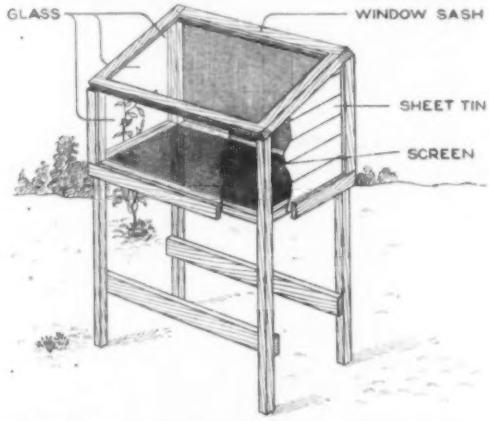
The old jack-in-the-bottle principle may be applied in the contrivance of a device for testing one's lung power that will furnish much amusement at little or no expense. Any large, clear-glass bottle may be used for the reservoir. The other requirements are a length of small glass tubing, a good cork to fit the bottle, and a pill vial. The glass tube is heated and bent as in the sketch, and is inserted through the cork. After the bottle has been filled with water to within about an inch of the neck, the empty pill bottle is dropped in upside down. It is then tilted with a pencil or other slender object and allowed to fill with water until it floats, bottom side up, practically in a balance between floating and sinking. Exertion of one's lung pressure down the glass tube forces the water to compress the air in the pill vial, causing it to sink. If sufficient pressure is exerted it will be sent to the bottom of the bottle, but will instantly rise again when the pressure is released. Calibrations are painted on the side of the bottle to form a basis for determining the amount of pres-



sure exerted. By decreasing the amount of water in the pill vial its sinking may be made more difficult.—William Roberts, Ayer, Mass.

An Outdoor Drier for Fruit and Vegetables

The evaporator illustrated is essentially a glass box with an open bottom and a tin back. The glass concentrates the heat and rays of the sun, the tin adds to the drying process by its power of reflection, while the open bottom permits free circulation of air. The frame is made of 2 by 2-in. lumber. The top consists of an old window, set at whatever angle will procure the greatest heat effect. Three of the sides are of glass, held in place by wooden strips. The fourth side, or back, is a piece of sheet tin. The bottom is of wire mesh, or heavy screen. To permit easy access, the glass sides slide freely in grooves, made by placing a thin strip of wood below the outer strips that hold the glass in place. Small holes are also drilled in the tin to aid ventilation. While vegetables do not dry as rapidly in such a contrivance as over a stove, yet they will dry satisfactorily if exposed the necessary time. The discomfort and heat



At Slight Expense One may Construct an Evaporator Which will Preserve the Surplus Fruits and Vegetables of Summer and Save Many Dollars during the Winter

of the stove, as well as the expense of fuel, is thus eliminated.—C. L. Meller, Fargo, N. D.

A Simple Smokehouse Made from a Barrel

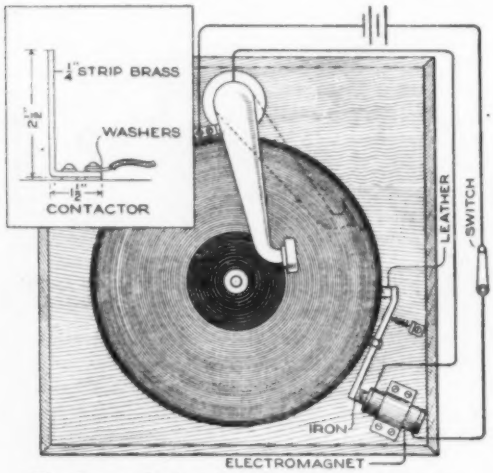
War-time conservation of foodstuffs makes the back-yard smokehouse a desirable institution for the preserva-

Much Fish and Fresh Meat That is Ordinarily Wasted in the Summer Because it Cannot be Immediately Consumed is Easily Cured for Winter Needs in the Home Smoking Barrel

tion of fish and meats, of which there is too much of a surplus for immediate consumption. Elaborate structures, such as used by large packing plants, are not necessary, and the same results may be accomplished on a smaller scale with a barrel smokehouse, as illustrated. An inverted bucket with a hole in the bottom is connected by a length of stovepipe with the barrel in which the product to be smoked is hung on nails driven in the sides. The fire is placed beneath the bucket in an iron kettle or other container, in which it will smolder and smoke rather than burn. A burlap cover over the mouth of the barrel insures just enough draft to draw the smoke through the pipe and cause it to linger in the barrel. Hickory chips used for fuel impart a most palatable flavor to the meat, although corncobs, or any nonresinous wood, makes a good substitute. Fish and small pieces of meat may be cured in the barrel in from two to three weeks. Hams or sides of bacon should be smoked from four to six weeks.—Sylvanus Van Aken, Port Ewen, N. Y.

Electric Device Stops Disk Phonograph Automatically

Only costly phonographs automatically stop the rotation of the turntable

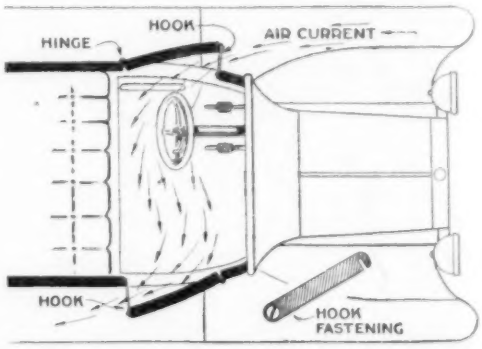


The Device Is Simply a Tiny Electrical Brake Which is Set Automatically When the Record has Finished Playing

with the completion of a record. A device, electrically controlled as illustrated, may be installed on any machine at slight expense. An electromagnet, such as may be procured from an old electric bell, is mounted as shown. A piece of 1/4-in. brass rod, 5 in. long, is then pivoted in front of the magnet by means of a wood screw passed through a hole in the middle, through several washers, and into the wooden structure of the cabinet. A small piece of iron, previously riveted to the end of this rod serves as an armature for the magnet. At the other end a small leather stop is mounted to act as a brake on the edge of the table. A small copper contact is also fastened to the cabinet, in such a manner that the amplifier arm will touch it when the record is finished. The current from two dry cells, which may be stowed in any convenient location, is wired through the magnet, to the amplifier arm, and to the copper contact. Thus the circuit remains broken as long as the record is playing, but is closed when the end is reached. The magnet pulls the lever, applying the brake to the whirling disk, stopping it automatically. A small switch mounted on the cabinet will be needed for breaking the current while the position of the arm is being changed and a new record put on.

Ventilation Provided in Auto by Additional Door

The front compartment of some automobiles is uncomfortably hot during the summer months, particularly in small cars provided with a rigid non-ventilating type of windshield and a blind door at the side of the driver. To eliminate this condition, the blind door was changed into a hinged one. With tin shears and a saw, the false door was cut out along the molding. A wooden frame was made for the cut-out door, to which it was screwed. Suitable wooden blocks were fastened to the body for the hinge and lock, these parts being purchased at a cost of 60 cents. Instead of having the door hinged forward, the hinge was placed at the rear. Metal fasteners were made for each door, and these secured as door hooks. These fasteners hold the doors open about 3 in., and when driving, a stream of cool air enters the front-opening door, passing out at the opposite side. This change, which cost less than $5, is well worth the price for the convenience alone, making



By Arranging the Blind Door So That It can be Opened, Excellent Ventilation is Afforded in the Front Compartment of the Car

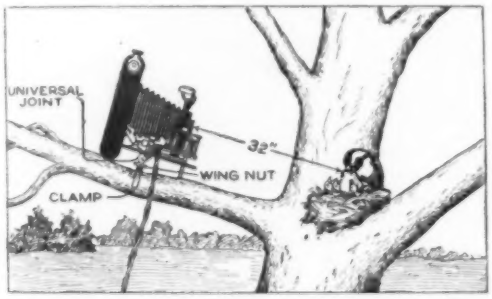
entry and exit from the driver's seat possible without disturbing a person in the seat at his side.

Hunting Song Birds with a Camera

By C. BREDER, Jr.

ONE of the most delightful of summer pastimes, as well as one that is of decided educational value, is the photographing of the feathered songsters that frequent our yards, the orchards, meadows, and woodlands. This is especially true at this time of the year when all the birds are busy with domestic duties and so many opportunities for photographing young birds in the nest are available.

At first thought, photographing birds may seem like trying to catch them by putting salt on their tails. But if done as illustrated it is not a difficult process and is infinitely more interesting than hunting with the object of destroying life. Any ordinary film, or plate, camera may be used. Plates have the advantage of permitting a closer focus, but films have also



The Camera is Clamped in Position After being Focused on the Spot Where the Birds Congregate. The Electrically Operated Shutter Does the Rest

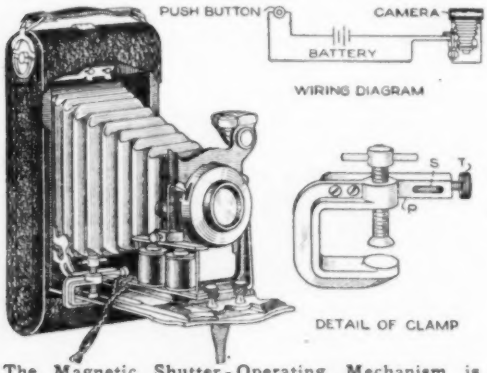
an advantage in being easily portable without danger of breakage. The shortcomings of the film camera may be remedied by the use of a portrait attachment, which may be purchased at any supply store for a trivial sum. This will permit focusing of the film camera to within 2 ft. 8 in. of the subject.

Birds are best photographed by setting the camera in focus with some point at which they congregate and then operating the shutter by means of an electromagnet when they get in front of the lens. The bird's nest is naturally the surest place for finding the occupants at home, or they may be baited in front of the camera by the use of a back-yard feeding board.

The electromagnet for operating the shutter is constructed as illustrated. The magnets M are procured from an old electric bell and mounted on strips of brass, B and Y, as indicated. The dimensions of this brass mounting will, of course, have to be determined by the style of magnets and camera used. A small screw clamp for holding the magnets on the camera floor will be necessary. A metal extension, P, is soldered onto this. A slot, S, is cut in the extension, and a thumb nut, T, is threaded into a hole drilled in the end to engage the magnet mounting and hold it securely. A steel magnet armature, as shown in the sketches, is set above the magnets and hung by a heavy wire that engages the shutter trigger. Two slender steel rods, R, are threaded into the armature and fit loosely into holes drilled through the brass magnet base. These serve as guides for the armature when it is drawn downward by the application of the current. A fiber block, E, is fitted and screwed to the top of the armature, and to this the shutter trigger, H, is fastened by a thumb nut, L. When these parts are assembled it becomes apparent that the fastenings for the magnets are readily adjustable as the bellows of the camera is racked backward or forward in focusing.

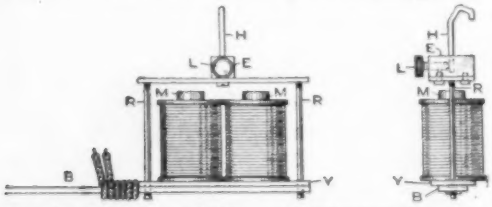
About 60 ft. of double-strand insu-

lated flexible electric cord, a push button, and two dry cells, are next procured. These are connected with the



The Magnetic Shutter-Operating Mechanism is Secured to the Side of the Camera by Means of a Clamp Which Permits Adjustment in Accordance with the Position of the Focusing Table

camera after the latter has been set on the limb of the tree or other perch where it is to be used. An excellent method of fastening the camera is with the use of a universal-headed clamp as shown in the drawing. Such clamps are obtainable for 75 cents at any photographic-supply house, or may be made to requirements in the home shop. After setting the camera, the wire is strung out, and the operator conceals himself in some position where he can see without scaring the birds. When the bird gets in front of the lens, pressure on the push button closes the circuit, the magnets are charged, and the armature pulls down the shutter trigger. Before he has time to think about being frightened the shutter has clicked and the image of



Details of the Magnetic Shutter Mechanism, Showing the Provisions Made for Adjustments and the Manner in Which the Parts are Assembled

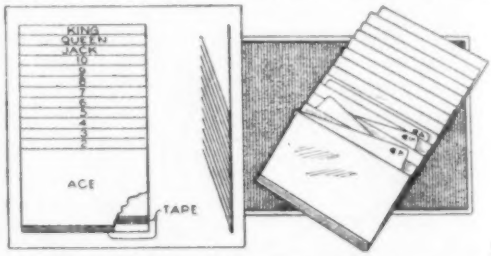
the feathered songster is recorded upon the film or plate. Boys will find far more pleasure in shooting birds with a camera than with guns, rifles, or sling shots.

Emery Compound and Strop for Razor Sharpening

Razors, or safety-razor blades, can be sharpened quickly by stropping them on a leather strop, on which an emery paste is applied. The strop can be made by tacking a strip of smooth horsehide over a block, 2 in. wide and 10 in. long. The leather is lapped over and tacked at the ends of the block. The paste is composed of five parts vaseline and one part very fine emery flour. The blades are given 15 or 20 strokes, wiped carefully, and finished on the usual strop. An unusually keen edge is obtained by this method.—Clarence Alleman, De Soto, Wis.

A Mechanical Card-Selection Trick

An amateur can provide clever entertainment with playing cards by use



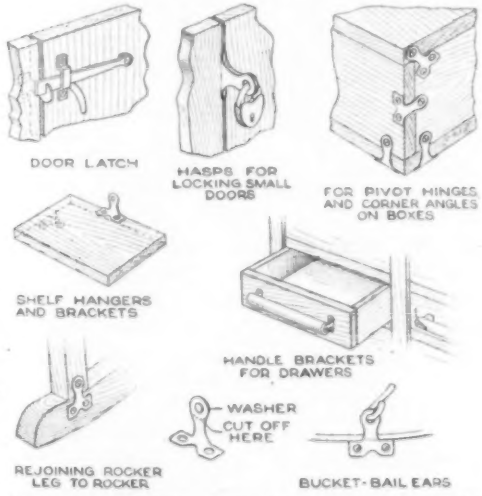
On the Right Is One of the Two Holders Used in a Clever Card Trick. The Diagrams Show How It is Made

of a mechanical device which makes it possible to perform a mystifying trick. A pack of cards is shuffled and halved, after which each half is placed in a trousers pocket. By using the means described herewith, the performer can quickly produce any card called for. Two 13-compartment cardboard holders are made, one for each pocket into which the shuffled cards are placed. Each consists of 14 pieces of stiff cardboard cut the width of a playing card and 3/16 in. longer, glued at one end with the aid of tape to a cardboard back. These 14 pieces are laid one on the other so that they lie practically parallel with the back, each projecting slightly beyond the one above it. In the first compartment of one holder is inserted the ace of hearts and the ace of

spades, in the second compartment the deuces of these suits, and so on up to the kings. The clubs and diamonds are arranged in the same manner in the other holder. That the black cards may be distinguishable by touch from the red ones, a pin is stuck through the projecting corner of each of the former so as to cause a projection on the front of the cards. By placing a duplicate pack, arranged as described, in one's pockets in advance, the performer can produce any card called for, apparently having drawn it from the shuffled pack.

Practical Uses for Old Window-Shade Brackets

A set of window-shade brackets comes with each roller shade, and if the unused fixtures are saved, the handy man will find them convenient for many emergency uses. A few of the uses to which they have been successfully put, when other materials were not at hand, are shown in the illustration. Two brackets, straightened out, were used as hasps for a small door. Pivot hinges for box lids, corner braces, or angle irons, window lifts, and shelf hangers, are some other

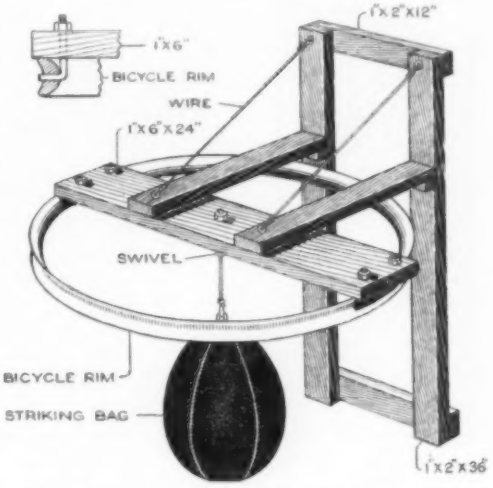


These Are Typical Uses for Extra Roller-Shade Brackets, and Others can be Devised as Required

typical uses.—T. H. Linthicum, Annapolis, Md.

Striking-Bag Disk Made from a Bicycle Rim

A thoroughly serviceable, yet inexpensive, striking-bag disk may be con-



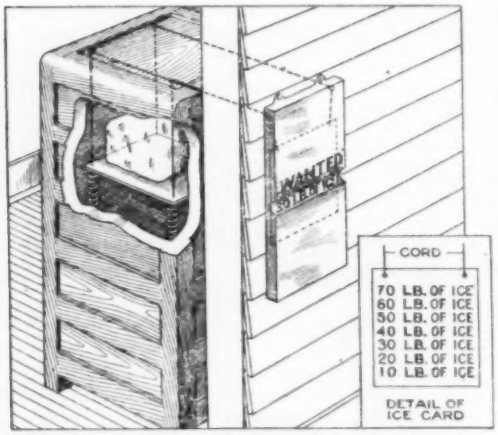
This Homemade Striking-Bag Disk, Constructed from an Old Bicycle Rim, Is Thoroughly Serviceable and Costs But a Fraction of the Price of the Commercial Article

structed by mounting an old bicycle rim as illustrated. Such a rim is usually obtainable secondhand for a nominal sum, and then all that is needed is a few boards of the sizes indicated and a little simple hardware. The frame is nailed together, as shown, fastened on the wall at the correct height, and the rim attached. This is accomplished by the use of four L-bolts. After bolting the bag cord in the center of the rim, it is advisable to brace the frame with two boards secured to the ceiling to relieve the frame and disk as much as possible of the jar from the constant pounding of the bag that naturally tends to loosen the fastenings.—James Keller, Alexandria, La.

Automatic Refrigerator Indicator Signals Amount of Ice Wanted

By the use of the refrigerator indicator illustrated the iceman is able to tell by a glance from his wagon just how much ice he will have to cut to fill the box. A false bottom is fitted

into the ice compartment of the chest and is mounted upon four coil springs of such strength that they are fully

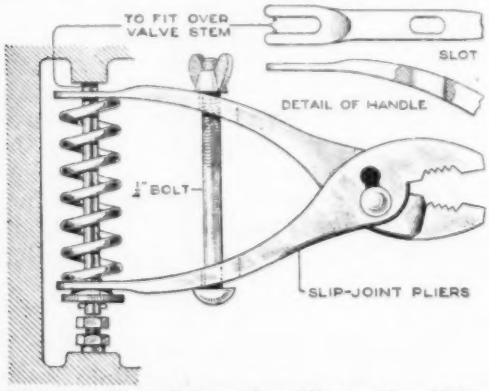


As the Ice Melts, the Position of the Sign Changes to Indicate to the Iceman the Amount He Should Cut to Fill the Chest

compressed with a full capacity of ice. As the ice melts and the weight decreases, the springs stretch out, moving the four cords indicated, which in turn change the position of the outdoor sign. When the box is filled the sign is drawn up out of sight.—Richard Evans, Franklin, Ohio.

Pliers Converted into Valve-Spring Compressor

The motorist who finds difficulty in compressing the valve springs of his

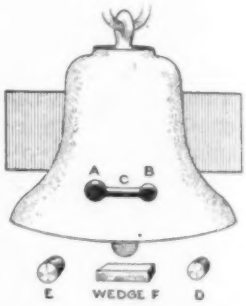


With the Pliers Converted as Illustrated, a Valve Spring is Compressed and the Valve Removed with Little Effort. A Few Turns on the Wing Nut Are Usually Sufficient to Enable One to Remove the Valve Fastenings

machine, when removing those parts for grinding, may make a serviceable tool for the purpose by equipping the handles of his slip-joint pliers as illustrated. This is done by heating the handles and flattening them slightly on an anvil. The ends are then slotted, as shown, and fitted with a ¼-in. bolt and wing nut as in the sketch. The slip-joint feature makes the tool readily adjustable for springs of various lengths, while the customary use of the pliers is in no way interfered with. The bolt may be removed and carried in the tool box. The handles should be rounded off on the points to form a convenient handhold.—G. A. Luers, Washington, D. C.

Changing the Tone of Disagreeable-Sounding Bells

Bells having tones which may have been thoroughly agreeable to the manufacturers are not always so pleasant to those who have to listen to them. This, however, is a condition which may be remedied at will. By drilling two holes in the side of a bell, as indicated at A and B in the sketch, the tone will remain perfectly clear, but will be quite changed. If a slot, as designated at C, is then cut between the two holes, still another change of tone is effected. By driving a metal rod E, into one of the holes and trimming it off flush with the internal and external surfaces, the tone may again be changed. Filling up the second hole with a plug D, will further alter the sound. Then if a wedge such as F, is cut and driven into the slot the tone of the bell will be restored to normal.—James E. Noble, Portsmouth, Ont., Canada.



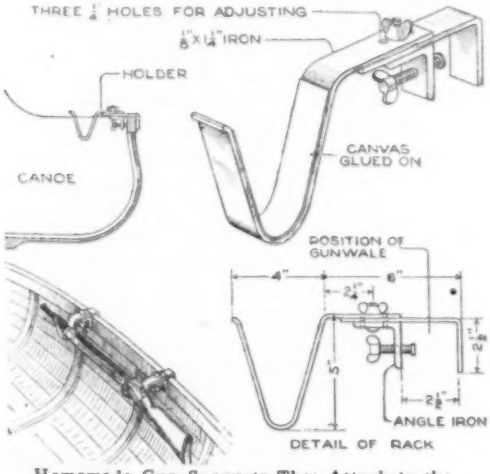
¶ Dry pigments are difficult to mix in oil, but if first broken up in alcohol, will mix with oil easily. For water-color work use vinegar.

Hot-Water Bag Handy in Filling Auto Radiator

A fellow tourist on a motoring tour filled his radiator with fresh water at a remote mountain spring, using a 2-qt. hot-water bag for the purpose. He found it the handiest sort of a container, as it folds up and fits in one of the door pockets. The hot-water bag, which had sprung a leak, was undesirable for its original use, and had been mended satisfactorily with adhesive plaster. An engine does better work when its radiator is frequently given a drink of fresh water, and such a handy water container makes this possible even on mountain roads.—Emma Gary Wallace, Auburn, N. Y.

Homemade Rifle or Gun Rack for a Canoe

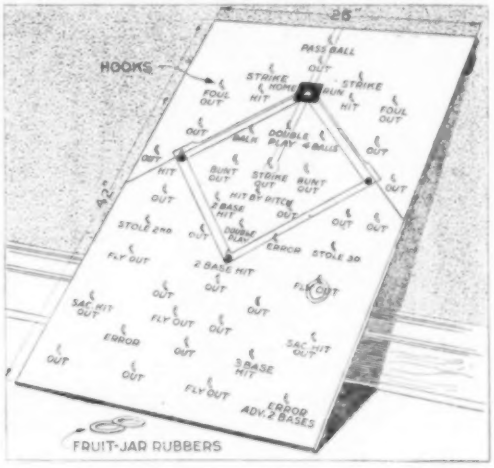
A gun rack consisting of two metal holders that attach to the side of a boat or canoe can be easily made with strips of band iron, of the dimensions shown, and two setscrews, a 6-in. vise and a 20-in. monkey wrench being employed to bend the iron into two V-shaped supports. Each of these has an extension at one side which, with an adjustable angle iron and a winged setscrew, forms a clamp that attaches to the gunwale. The angle iron is tapped with 3/16-in. standard threads to receive the setscrew. To the inner surface of each holder shellacked canvas is glued to prevent marring the weapon.



Homemade Gun Supports That Attach to the Gunwale of a Canoe by Means of Clamps and Setscrews

Indoor-Baseball Game Played with Fruit-Jar Rubbers

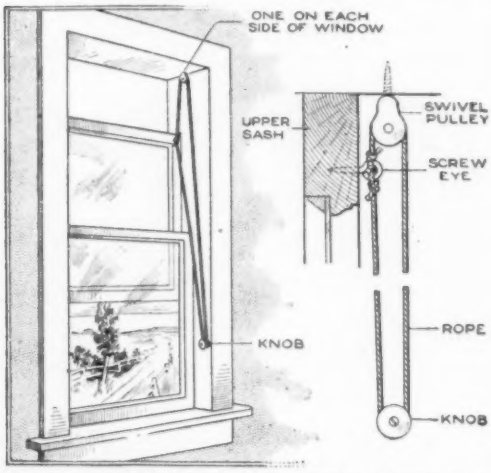
Many of the thrills of baseball may be experienced by tossing fruit-jar rubbers at a board laid out to represent a diamond, as indicated by the sketch. The board is 42 by 25 in. in size, and the diamond is 12½ in. wide. The pitcher's box is 14 in. from the top of the board, and the width of the base lines is 1⅛ in. The coach's box is ¾ by 2½ in. The home plate should be 2½ in. square. Picture hooks are screwed into the board, and the various plays marked as in the illustration. The game is played by two persons. They stand about 10 ft. away and toss the fruit-jar rubbers until one rings "three outs," "three strikes," etc. If a hook marked "hit" is ringed, the rubber is removed and placed on first base. If the next play is four balls, the rubber is removed and placed on first base. The ring on first base is then advanced to second base, and so on. The board may be painted in attractive colors, and a wire frame with a net attached to the bottom provided to catch the rubbers that miss a hook.—M. De Long, Kankakee, Ill.



The Parlor-Baseball Game Affords Many Thrills and Is One of the Most Interesting of Indoor Sports

Rope and Pulley Aid Bedroom Window Ventilation

Sleeping rooms are always best ventilated by having the upper sash of the window open. The opening of the

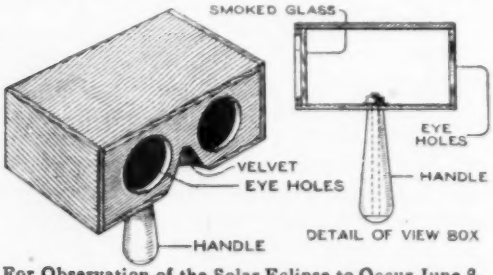


The Rope-and-Pulley System Permits Opening or Closing of the Upper Window Sash without the Necessity of Climbing on a Chair or Using a Stick

upper sash, however, is usually difficult because it is out of one's reach and suitable handholds are ordinarily lacking. This difficulty is eliminated by the installation of the simple rope-and-pulley system illustrated. To open or close the window a pull either way on the rope is all that is needed.—James T. Ford, Chicago, Ill.

Optical Box Aids Observation of Solar Eclipse

On June 8 the United States will witness an eclipse of the sun. In some parts of the country the darkness will be complete. In other places it will be



For Observation of the Solar Eclipse to Occur June 8, a Cigar Box Provided with Eye Holes and a Piece of Smoked Glass Is a Convenient Eye Shield

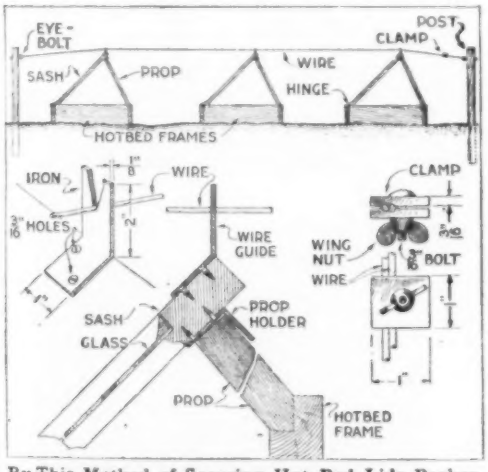
partial but none the less interesting to watch. To look at the sun during this occurrence one will need to protect his eyes. An excellent eye shield for the purpose may be fashioned from a cigar box, as illustrated. The back of the box is sawed out with a coping saw, as shown, and a piece of clear glass fitted over the opening. Several triangular window tacks are used to hold the glass in place. Two eye holes and a notch for the nose are cut in the front of the box, and to the edges of these pieces of velvet are tacked for the sake of comfort. The inside of the box should be painted black to avoid reflection. After the paint has dried, the glass is smoked on the inside with the flame of a candle. The glass should not be touched after smoking, and by nailing the lid shut it is protected permanently. A handle, as shown, will be found convenient, although not necessary. With such a protector one may watch the progress of the eclipse without danger of injury to the eyes.

Ventilating a Photographic Dark Room

Photographic dark rooms should, of course, be light-proof, and in an effort to obtain this condition, the question of ventilation is often neglected. Good air is necessary for the comfort of the operator, and is especially essential in summer, to reduce the room temperature. A hot dark room means poor photographic results. The best method of securing ventilation is to force air into the room. This cannot be done handily by an electric fan in a direct opening in the wall, because of the admission of light. A wooden conduit, 12 in. high, 14 in. wide, and 8 ft. or more long, solved the problem. It was built to permit cool, fresh air to enter the room near the floor, and suitable provision was made for the exit of the warm air, near the ceiling. The air was blown into the room by an electric fan placed at the opening. The factory photographer who devised the arrangement found it indispensable.—C. M. Hall, St. Louis, Mo.

Hotbed Frames Guarded by Wire Support

The glass-covered frames of hotbeds are often damaged, especially by the breaking of the glass, when the wind dislodges the props supporting the frames raised to admit the spring air. A device to prevent this damage, and which can be applied on rows of hotbeds up to 20 in a row, is shown in the sketch. The raised frames are held rigid by a taut wire which engages notched metal fittings set on the frames, as shown. To install such a guide wire, two 4 by 4-in. posts are set in the ground at each side of the hotbed rows. An eyebolt is then set in each post and a heavy wire stretched between them. The position of the wire should be determined by raising the sashes and stretching a cord over their tops between the posts. All of the sash props are made the same length. Pieces of band iron, as detailed, are notched and bent to the proper angle, and fixed to the edges of the frames with screws, to form sockets for the wire. By looping one end of the wire through the eyebolt and fastening it with a clamp, as shown in

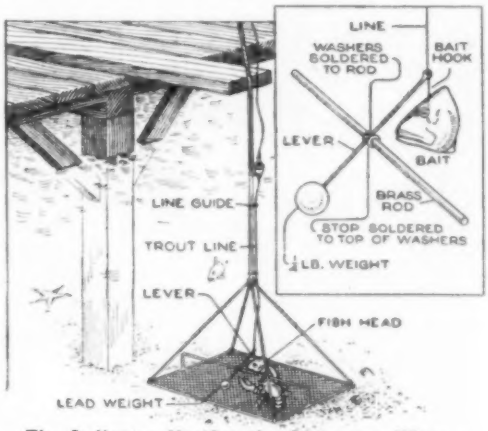


By This Method of Securing Hot-Bed Lids Broken Panes and Other Damage Often Resulting from Sudden Gusts of Wind are Made Impossible

the clamp detail, the wire may be conveniently adjusted to the proper tension.—P. P. Avery, Garfield, N. J.

Indicator for Dip Nets Makes Crab Fishing Interesting

Fishing for crabs, as well as lobsters and fresh-water crawfish, becomes as interesting as angling for game fish,



The Indicator Notifies the Fisherman When a Lobster, Crab, or Crawfish Enters the Dip Net and Touches the Bait

if one's dip net is provided with an indicator, as shown in the sketch. With this simple device one "gets a bite" in his net the same as with a hook and line. A $^3/_{16}$-in. metal rod is bent at right angles near the ends and soldered to the frame of the net, as illustrated. Over the horizontal portion of this rod a 10-in. lever is pivoted and held in place by two washers which are soldered on either side of the lever. The washers, of course, are placed on the horizontal rod before it is soldered to the net frame. A metal strip should be soldered across the top of the washers to act as a stop so the tilting action of the lever will not be more than 2 in. On one end of the lever the bait hook is fastened and on the other end is a ¼-lb. weight slightly outbalancing the bait, as shown in the sketch. An ordinary trout line is run from the baited end of the lever through guide lines on the net cord and to the fisherman's hands. A cork float may be used if desired. With the indicator complete, the bait is held about ½ in. clear of the bottom of the net, and thus the slightest nibble is signaled to the fisherman. The net is then hauled up.—Mark L. Brochier, Los Angeles, Calif.

Trunk Till Equipped to Serve as Emergency Bathtub

By fitting a heavy reinforced till into his trunk, and lining it with impregnated canoe canvas, a man whose work

A Watertight Compartment Fitted into an Ordinary Trunk Permits One to Have a Luxurious Bath in Temporary Locations Where No Facilities for Bathing are Provided

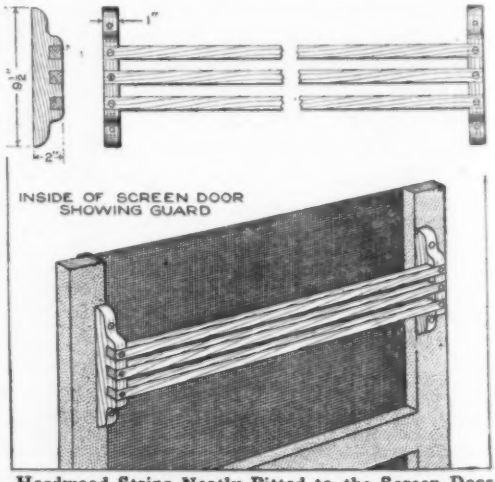
keeps him traveling about with a construction crew during the summer has provided himself and his family with the means of having a bath each day. The till and its fastenings were strengthened to hold the combined weight of the user and the water with which it is filled. It was then covered with canoe canvas which was tacked in place with copper tacks and the seams covered with white lead. The canvas was waterproofed with two coats of white lead. The ends of the canvas are left of sufficient length to fold over the edges of the trunk. This avoids the possibility of water being splashed over and into the trunk during the process of bathing. The till is 16 in. deep, but need not be filled to a depth of more than 4 in. for a satisfactory bath.

Lens Caps for Cameras Made of Tin Covers

A lens cap for a camera made of a tin cover is a useful accessory which can be easily made by most amateur photographers. The cap gives the lens protection from dust and is handy in learning the operation of the shutter or of automatic trippers. Select a small, round, stamped can or cover, slightly larger than the outside diameter of the lens cell. Cut down the can to the proper depth and file off any rough edges. The inner surface of the can is then lined with felt or chamois, permanently glued in place. The cap should be easily slipped over the lens cell and must hold its position by only slight friction grip. The outside can be given a finish of black enamel.—John Hoeck, Alameda, Calif.

Guard Strips Protect Wire of Screen Door

In order to give the best results from the standpoint of ventilation, screen doors are often made with large panels of wire screening, which is easily damaged in opening and closing the door. A good protection can be easily made by fitting strips across the door, as shown in the sketch, rather than protecting the area near the unhinged edge. Hard wood is best for this fitting, as it can then be made of lighter stock. The strips should be about ¾ in. square and set in supports of about the same thickness. This guard will be found especially convenient for opening the door with the shoulder,



Hardwood Strips Neatly Fitted to the Screen Door Provide a Good Protection for the Screen

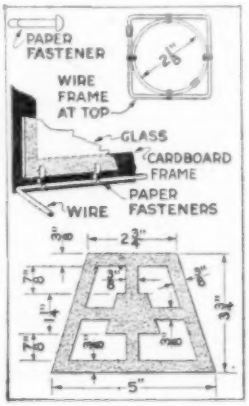
when one's hands are full.—R. N. Hawley, Cleveland, Ohio.

Small Metal Cups Hold Typewriter in Place

The tendency of a typewriter to shift out of position on the table, or other support, while in use, may be easily overcome by setting the two rubber buffers, at the back, in small metal cups, fixed to the support. Furniture floor pads, of the metal-disk type, serve the purpose, and bottle caps are also suitable. They are fastened through a hole in the center, by means of flat-headed screws. If the metal cups are too hard to be drilled easily, anneal them in a gas flame, or fire.

Cardboard Lamp Shade Disguised to Resemble Brass

To produce a side-bracket electric shade from waste materials at hand, some Bristol board was cut with a sharp knife, as indicated. It was then given a coat of light oak stain, which produces the appearance of old sheet brass. Some heavy wire was then bent into two squares, one square to connect the top portion of the panels, and the other for the bottom. Brass paper fasteners were used to secure the panels to pieces of old art glass. The parts were then assembled. To insure rigid construction, solder was applied to all joints of the wire. A wire ring, 2⅛ in. in diameter, was fastened to the top square, so the shade could rest on a standard support. This support rests on the electric globe and clutches it with prongs. Only a close scrutiny of the lamp would disclose that it is not of brass construction.—A. W. MacMillan, Chicago, Ill.

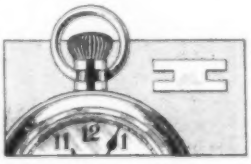


Advertisements on Sidewalk with Projected Light

There are numerous commercial articles for projecting advertisements by means of light, but their cost generally prohibits their use by the small shopkeeper. By the simple home-contrived arrangement illustrated costly lenses and similar equipment are dispensed with, and the owner of the most humble shop is enabled to derive such benefits to his business as sidewalk advertising may have. The desired advertising display is first chalked on the inside of the shop window, and is later made permanent with gold leaf or black enamel. A small automobile spot light, or even an ordinary incandescent globe with a reflector behind it, is then arranged in such a position that its light will project the shadow of the lettering on the glass to the desired location on the sidewalk.—A. J. White, Kingston, Ont., Can.

Clip for Watch Stem Prevents Accidental Setting

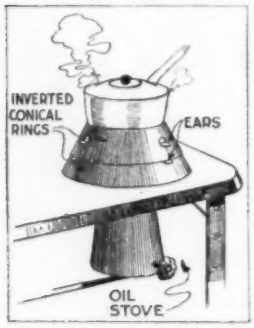
Watches of the popular-priced stem-set variety have a pernicious habit of changing time whenever one stoops over so as to compress the stem slightly in the fob pocket. To remedy this I made a clip, as shown in the sketch, from a piece of closely coiled clock spring. This slips onto the stem of the watch, as illustrated, and avoids all possibil-



ity of the position of the hands being changed in any way other than intentionally. To set the watch, it is a simple matter to remove the clip.—John Wallace Shaw, Palmer, N. Y.

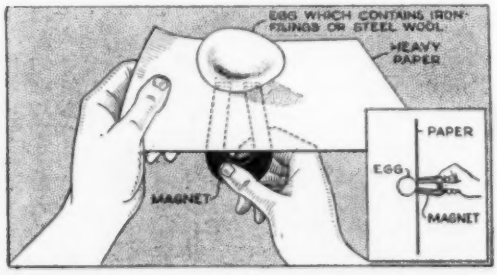
Removable Cones on Oil or Gas Stoves Conserve Fuel

The fuel bill of an oil or gas cooking stove may be greatly reduced by the contrivance and use of the simple heat-conserving device illustrated. The shape of all ordinary cooking utensils, with few exceptions, is such that when they are set over the flame much of the heat escapes through the space around the sides. The conical rings prevent this and cause the heat to be concentrated on the bottom of the vessel. Small ears, which are produced by punching out and bending over a small section of the metal, insure each successive cone always assuming a level position.



Magnetic Egg Affords Great Amusement

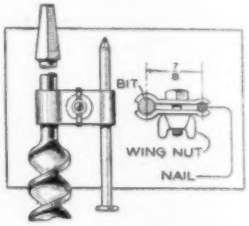
Considerable amusement may be had at trivial expense with the aid of a magnetic egg, as shown in the drawing. Such an egg is made by tapping a hole in the end of the shell and blowing the contents with a straw or other slender hollow object. The empty shell is then allowed to dry thoroughly, after which it is filled with iron filings or steel wool. The latter is best because with it the shell can be filled without causing abnormal weight. Paraffin is used to seal the hole after the stuffing has been put in. When an electro or permanent magnet is brought near the egg it will begin to roll, and by shifting the magnet many queer effects are produced.—George Perkins, Milburn, N. J.



The Magnetic Egg can be Made to Roll over a Piece of Paper, up a Perpendicular Surface, and to Perform Many Other Weird Antics

Bit-Depth Gauge for Drilling Holes in Wood

When several holes of a given depth must be bored into a piece of wood it is difficult to get them all of equal depth without some form of a depth gauge. Such a tool is not ordinarily to be found in the amateur's kit. A tool that may be quickly improvised, and one which will give satisfactory service, is made from a large nail, a double-ended clamp, and a bolt and wing nut, as shown in the sketch. The nail is adjusted in the clamp and the clamp attached to the drill in such a manner that the boring operation is brought to a halt whenever the desired depth has been reached. In using this tool on finished work, care should be used to prevent the gauge from marring the surface.—R. L. Stanton, Chicago, Ill.



Mucilage Jar Converted Into Handy Double Inkstand

An old mucilage pot of the three-cell type having compartments for mucilage, water, and the brush, may be converted into a practical inkstand that is not easily overturned. After being thoroughly cleaned, one compartment is filled with mustard-seed shot. The other compartments serve as contain-

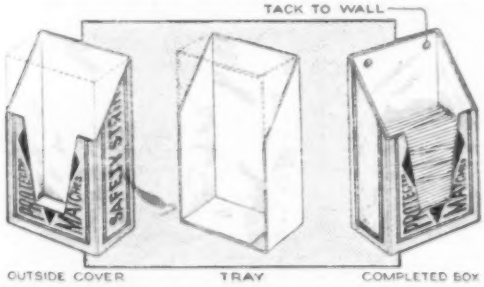
ers for ink of two colors. Pen points are quickly cleaned by dipping them into the shot, and the weight holds the inkstand securely on the desk or table. —M. L. Gregoire, Quebec, Can.

Old Overall Buttons Converted into Bill-Posting Tacks

Old overall buttons, with the wires cut off and squeezed together, are excellent for posting handbills. It is an easy matter to clip off the wires with a pair of side-cutting pliers. The stubs of wire are then pinched together, and a large-headed tack is the result.—H. K. Capps, Stahl, Mo.

Mouse-Proof Match Holder Made from a Carton

The carton in which matches are purchased may be converted into a serviceable container by cutting the tray and cover and assembling them as shown in the sketch. After being altered, the box should be tacked to the wall near the stove, or at any other convenient location. When so placed, the matches are out of the reach of mice or children, are less liable to accidental ignition, and are always readily

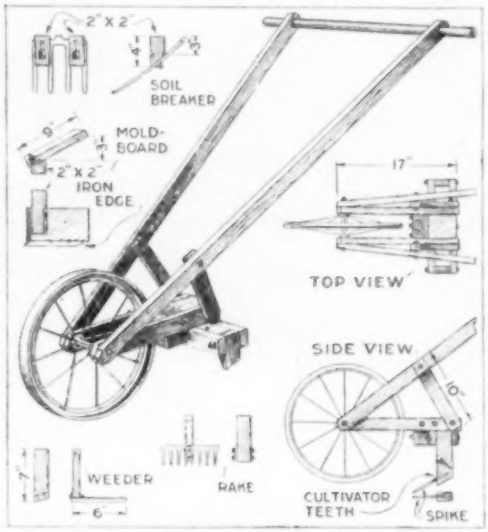


With a Sharp Knife, or Shears, a Cardboard Match Box may be Quickly Converted into a Handy Wall Safe

accessible.—Edwin Edgerton, Alhambra, Calif.

A Homemade Garden Cultivator

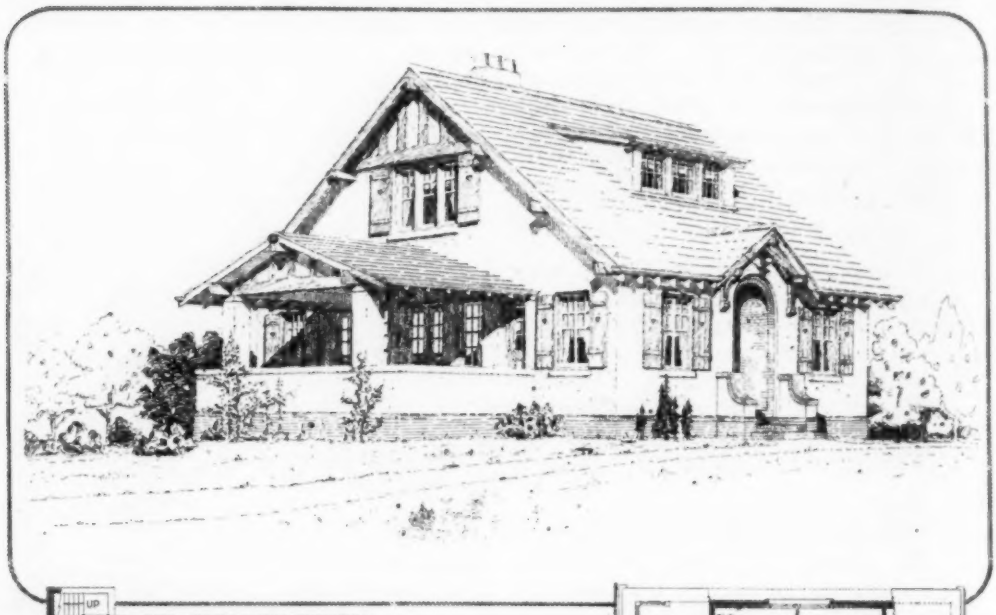
A garden cultivator may be constructed inexpensively from waste material, usually found about the garden, or in the home workshop. Ash, spruce, or other clear wood is satisfactory for the purpose. The wheel is obtained from an old baby carriage, or toy

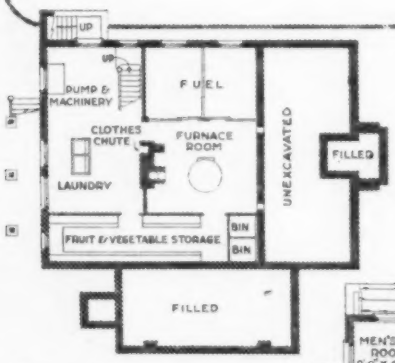


The Homemade Cultivator may be Constructed with Little Effort and Small Expense, but It will Make the Home Garden a Pleasure by Eliminating Much Irksome Toil

wagon. It should be at least 16 in. in diameter. A barrel hoop is wired over the rim to keep it from sinking into soft ground. With the exception of the blocks, which are 2 by 4 in., the stock used is 1 by 2 in., in section. The sidepieces are beveled at the lower ends to fit the frame closely. The handle is a section of broomstick, fastened with screws. The width of the frame at the bottom is determined from the length of the wheel hub. The cultivator support blocks are securely bolted to the frame, and an 8-in. bolt serves as an axle. Washers are placed at the nut fastenings. The cultivator teeth are made from 6-in. spikes, set on an angle, as detailed. The holes for them are bored to a depth of 1½ in., and the spikes are driven in, at the head end, after the heads are cut off. The weeder is made from a strip of iron, and a block, as detailed, the edge of the strip being sharpened. An old fork bolted to two blocks, as shown, makes a useful soil breaker, for new ground. Half of a broken rake may be utilized for some of this work. A mold-board attachment, as shown, is useful for banking the soil around plant roots.

ARTISTIC HOME FOR THE PROGRESSIVE FARMER



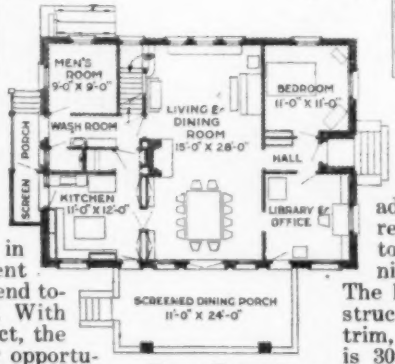


BASEMENT PLAN

An Artistic, Well-Arranged, and Substantially Built Farm Residence of Moderate Cost

SECOND-FLOOR PLAN

A. THOMSON THORNE, TULSA, OKLA., ARCHITECT



FIRST-FLOOR PLAN

CIRCUMSTANCES have conspired to make the average American farmhouse unattractive. This has been particularly true in the middle West. At the present time, however, there is a trend toward more artistic designing. With the services of a good architect, the agriculturist has a greater opportunity than the city man to erect a residence that is as appealing on the outside as it is harmonious and comfortable within. In the interest of better farmhouses the Illinois chapter of the American Institute of Architects, in collaboration with the Illinois State Board of Agriculture, recently conducted a contest among architects for a masonry residence adapted to rural needs. The result of the competition was to bring forth the prize-winning plans presented herewith. The house is of hollow-tile construction with stucco finish, brick trim, and slate or tile roof. It is 30 by 41½ ft. in ground dimensions, two stories high, and utilizes all of the basement space. The estimated cost of constructing it is $5,000. This amount could be reduced by substituting a wood frame for the tile. Yellow pine is used for the interior trim and hardwood floors are provided in the principal rooms.

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Victor Records

-the living evidence of an artist's greatness

What is it that makes an artist famous? That wins the applause of appreciative audiences? That establishes an enviable reputation as a great artist in the hearts of music-lovers?

The answer is indelibly inscribed on Victor Records. They are the living evidence of an artist's greatness. They reproduce the art of the most famous singers and instrumentalists with unswerving fidelity.

With the Victrola you can enjoy these superb interpretations at will right in your own home. But *only with the Victrola*—for the world's greatest artists make records for the Victrola exclusively.

Any Victor dealer will gladly play for you any music you wish to hear and demonstrate the various styles of the Victor and Victrola—$10 to $400. Period styles to order from $375 to $950. Saenger Voice Culture Records are invaluable to vocal students—ask to hear them.

Victor Talking Machine Co.
Camden, N. J., U. S. A.
Berliner Gramophone Co., Montreal
Canadian Distributors

Important Notice. Victor Records and Victor Machines are scientifically coordinated and synchronized in the processes of manufacture, and their use, one with the other, is absolutely essential to a perfect reproduction.

New Victor Records demonstrated at all dealers on the 1st of each month

Victrola XVII, $265
Victrola XVII, electric, $325
Mahogany or oak

Victor Supremacy

NEW ONE

FOR USES WHICH INVITE DECAY, YOU SHOULD SPECIFY, AND INSIST ON "ALL-HEART" WOOD. IT WILL PAY YOU.

Buy your Cypress by the Cypress Arrow,

Look for this on every board or bundle offered as Cypress. It identifies the TIDE-WATER product, the true "Wood Eternal."

AND SPECIFY "ALL-HEART"

The Cypress "Pergola-Garage"

Why should a garage be homely? This one isn't.—(Is it?)

The man in front is the owner. He looks well satisfied with the fact that he has enhanced the beauty of his grounds at the same time that he has protected his car.

The picture shows how *your* garage may look if you will allow us to send you, with our compliments, and with no obligation at all, the

Complete Working Drawings (on sheet 24 x 36 inches)

including full specifications—enough for any good carpenter to build from. Perhaps you enjoy such work yourself. If so, you can't go wrong.

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Contents for June, 1918

Accident—Broken Rail Brings Death to Soldiers 818
Accident—Halifax Victims Blinded 844
Accident—Street Car Plunges Through Wall 815
Aerial Mail Service Saves Time 840
Aeroplane Propellers, Cutting Four at Once 889
Aeroplane Propellers, Device Cuts Bolt Holes in 908
Aeroplane Rifles, Remarkable Bullets Used by 892
Airman Decorated After Escaping Huns 834
Airman Survives Thrilling Accidents 818
Ambulance, Navy, Good Designing Seen in 831
Ambulances, Floating, for Wounded 904
Automobile—Beach Car, White Enameled 878
Automobile—Bed Formed by Hinged Seat 887
Automobile, Family Travels Night and Day in 804
Automobile Is Tractor for Sleigh Train on Green Bay 905
Automobile Seats, Metal Base Clamp for 837
Automobile, Small, with Motorcycle Engine 827
Automobile Springs, Leaf Spreader for 916
Automobile, Stalled, Chain Ladder for 893
Automobile Turns Turtle during Race 884
Automobile Turntable, Model of for Salesman 869
Automobile Windshield on Hinged Center Cowl 841
Automobile Windshield, Pad Prepares for Rainstorm 922
Automobiles, Loading Saves Space 861
Automobiles, Spraying Outfit for Cleaning 828
Bait, Artificial, Has Scalelike Finish 919
Banner, Glory of France is Theme of 856
Bath Wagons for Philadelphia Troops 805
Battleship, Stoking on, in the War Zone, by Lewis R. Freeman 809
Bell, Silent for Years, to Ring in New York 890
Bombproof Shelters for Mining Camps 889
Bricks, Apparatus for Setting 905
Bridges, Plank Runways Lessen Strain on 844
Building, Liberty Hall, Erected in One Day, by Fred Telford 821
Buildings, Frame, for Government War Clerks 919
Camp Traffic, Army, Controlled by Semaphore 859
Canoe Rack, Movable, for Boathouse 885
Cars, Coal, Moved from One Ferry Boat to Another 863
Chapel, Army Camp, Engineers' "Castle" Motif of 843
Chemicals, American, Foreign Demand for 859
Children, Patriotic Doings of 920
China a Great Field for American Inventors and Producers, by F. H. Williams 912
Church Opens into Conservatory 860
City Hall in Philadelphia is Dormitory for Soldiers 901
Civic Features for Comfort of Residents and Visitors 872
Clothing, Men's, Standardized in England 898
Coal, Vein of in Basement of Home 871
Coinage System, Decimal, Proposed for England 864
Color Meter, Gives Values in Numerical Terms 830
Column, Stone, Repaired without Removing 880
Commutator Resurfaced without Lathe Work 832
Concrete Post with Separate Base 922
Concrete Roads, Tests Show Saving in Operating Motor Trucks on 895
Conveyor, Material, Lessens Labor Cost 867
Copper Ores, Flotation of with Salt Water 804
Corn, Seed, Rack for Testing 919
Cotton, Unwoven, Leather Substitute of 917
Crane, Locomotive, at Panama Dock 875
Crutches Have Rocker Ends 833
Cultivator, Riding, Has Novel Control 904
Dental Car for Army, Well Equipped 874
Dishes, Huge Wooden, Used by Indians 804
Dog, Crippled, Uses Rubber Tired Wheels 870
Drilling Machine, New, for Heavy Service 859
Drilling Machine Turret Head Has Five Spindles 885
Dye Industry, America is Developing 885
Eclipse, The Coming Total Solar, by Prof. Edwin B. Frost 865
Electric Lamp Has Six Lives 871
Electric Lighting Unit Fits Any Socket 885
Electric Loads, City's, Cardboard Peaks Show 886
Electric Power, American, Proposed for France 874
Electric Socket, Adapter Doubles Capacity 913
Electric Truck Equipped with Small Crane 837
Electricity, Converting into Steam 830
Elk, Well Placed Bullet Saves from Death 843
Eraser Hooks to Typewriter Frame 922
Explorer, Heroic Effort to Save Life of 826
Farm Work, Women Enrolled for in New England 906
Farmhouse, Artistic, Built at Moderate Cost 960
Fat, Machine Separates from Water Used in Washing Wool 876
Fences and Walls for Well Planned Grounds 910
Fern, Japanese, Flower of Excites Interest 875
Fire—Courthouse in Springfield, Ohio, Burns 868
Fishing Boat, Portland, Oregon, Fits Up 862
Furniture, Squat, for Fireside 913
Furs, Great Increase in Value of 870
Garage, Auto Parts Bin for 916
Glass, Front of Office Building Made of 904
Grapple, Wood, for Handling Logs 879
Grinder, Swinging, Fan Draws Dust from 898
Gymnasium, Employes Paid to Exercise in 891
Harbor, French, Our Engineers Remake 833

[Continued on Page 6]

Popular Mechanics offers no premiums; does not join in "clubbing offers," and employs no solicitors to secure subscriptions. It is for sale by nearly every newsdealer in the United States and Canada.

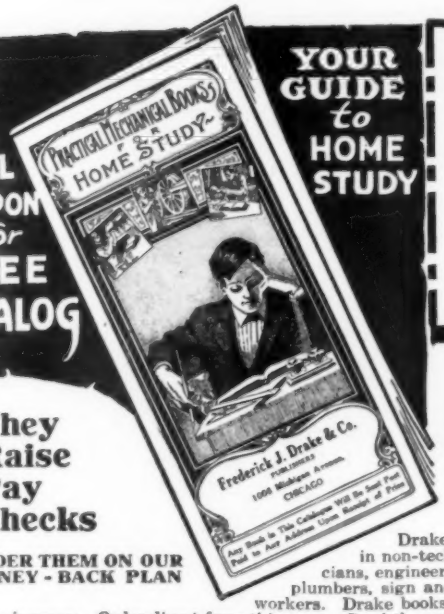
[Contents—Continued]

Hearts, Home Decorated with..... 886
Hens, Laying, Trap Nest for..... 871
Hogs to Get Garbage from Cities..... 898
Homes for Factory Employes in Village Beautiful 918
Hospitals, Field, on Motor Trucks..... 835
Hydroelectric Power, Niagara's Needed..... 889
Ice Cakes, Calculating Weight of..... 922
Ice Chimneys Form Above Air Holes..... 857
Ice Jam in Ohio River Causes Serious Flood... 889
Knitting, Silk Ribbon Takes Place of Wool for.. 819
Laboratory Table Has Many Conveniences..... 893
Liberty Ball, Bond Buyers Roll Across State.... 835
Liberty Bonds, Printing a Big Task..... 832
"Liberty Temple" in Portland, Oregon..... 816
Library, Newark, Displays Model of Camp Dix 829
Locomotive Tender Has Comfort Features..... 832
Logs Split Quickly by Riving Machine..... 868
Lycopodium, Substitute for..... 879
Measuring Instrument for Machine Work..... 903
Merry-Go-Round Imitates Derby Race..... 917
Milk, Emulsor Makes Powder, Water, and Butter into 856
Moccasins, Fleece Lined, for Airmen..... 819
Motor, New Sleeve Valve 908
Motor Truck Express, Akron-Boston..... 857
Motorboat Trade in Chinese Port, Typhoon Aids 840
Motorcycle's Wheels Interchangeable 829
Motors, Gasoline, Shipped Knocked Down to Users 802
Newspapers, Roofed Holder for..... 864
Nickel, Solid, Ware of Rivals Aluminum..... 908
Novelties for the Home and Its Members..... 914
Nut Cracking Machine Saves Culls..... 906
Official Bulletin, Persons Asked to Read..... 836
Oil and Grease Conserved at British Garages... 802
Ordnance Base Depot in France for Our Repair Work 829
Organ, Folding, Looks Like Suitcase..... 863
Paint Sprayer Has Valuable Features..... 820
Park, Bisbee, Arizona, Carves in Hillside..... 891
Pen Brace Helps Pupils Write Correctly..... 844
Pergola is Children's Memorial..... 869
Phonograph Cylinders Used for Correspondence 837
Phonograph, Hidden, Grandfather Clock Has... 841
Pianist's Finger Replaces Thumb..... 844
Radiator, Electric Steam..... 909
Railroad Cars for Soldiers Abroad..... 894
Railroad Roller Skates Are New Seven League Boots 801
Railroad Station, Concrete, Moved without Injury 878
Razor, Safety, Has Sliding Saw Action Blade... 843
Ring Gauge for Jewelers..... 919
Road Building, Vast Sums for..... 916
Road Making Machine Is Scarifier and Grader.. 880
Rocking Chair Has Reading Lamp Canopy..... 835
Rowing Crew Shows Patriotism in Its Name... 836
Rubber, Old, Used in Denver..... 842
Rug, Liberty, Pictures Nation's History..... 817
Rust Cutting Liquid Aids Motor Car Repairing 856
Salt Baths Preserve Uncreosoted Piles..... 895
Saw, Power Driven Drag, Works Rapidly..... 896
Ship—"Coos Bay" Salvaged Far from Water.... 876
Ship—Steel Tanker "Mexoil" Launched..... 896
Ship, Uncompleted Hull of Serves as Auditorium 808
Shipbuilders, New Towns to House..... 899
Shipbuilders, Teaching Tradesmen to be..... 847
Shipping Losses, British Admiralty Figures on.. 902
Shoes, Worn Out, Allies Use..... 908
Signal Corps Work, Free Schools Train Boys for 838
Sleeping Cars, Lights Under Seats in..... 892
Soil, Electrified, Test Seeds in..... 862
Soldiers, Blind, Train for Good Positions..... 816
Soldiers, Illiterate, a Serious Problem..... 860
Soldiers, Only Requested Articles Mailed to..... 819
Soldiers, Wounded, White Posts Aid..... 831
Stamps, Thrift, Hotel Sign Boosts Sale of..... 893
Statue, World's Fair, Duplicate in Bronze.... 840
Steel Made in Brazil for First Time..... 887
Stove, Collapsible Camp 879
Street Sweeper Operates at Low Cost..... 858
Submarine Chaser, College Professor Invents... 922
Submarine, New Recruit in Fight with..... 894
Surgeons Learn Viewpoint of Wounded Soldier 861
Tank Car Collapses after Cleaning..... 888
Tank Does Destructive Work in Boston..... 833
Tanks, One Man, for War Use..... 819
Target, Portable, for Indoor Shooting..... 839
Tides Work Havoc on Staten Island..... 828
Tire Mending Aided by Casing Spreader..... 864
Tires, Deflating Device for Inner Tubes..... 906
Tractor, Farm Implements Integral with..... 900
Tractor, Reversible, Built on Novel Plan..... 839
Train Ferry, First, English Channel Crossed by 825
Trees, Waste in Cutting..... 837
Truck, Brakes Make Easier to Load..... 826
Truck Hauls Structure to New Site..... 842
Truck, Motor, Has Loading Apparatus..... 870
Truck, Motor, Has Pump and Pavement Cutter.. 858
Truck, Motor, Loading Apparatus on Saves Time 897
Truck, Self-Loading, Has Demountable Body... 903
Tunnel, St. Gothard, Surveyors Check Levels of 842
Typewriter, Chinese, Has Thousands of Symbols 826
Typewriter Table Is Collapsible..... 877
Underwear for Soldiers Disinfected against Lice 860
Unsung Heroes, Part II—"The Buzzer," by E. T. Bronsdon 881
War Fund Campaign, Treasure Chest Used in.. 803
War Savings Drive, Warship "Thrift" Shows Progress of 826
War Work, "Kaiser Board" Wins Gifts for.... 830
War, World:
Aeroplanes, Germans Use Underground Hangars for 849
Blind Soldiers Act as Farm Laborers in Germany 854
Bombs, Aeroplane, Falling on Trieste..... 855
Bridges, Sheet Metal, Used in Mud by Soldiers 851
Concrete Barge is Foundation for Naval Gun 852
French Aerodrome on Western Front..... 855
German Raider "Alexander Agassiz" Captured by American Seamen..... 853
Gun Hidden in Artificial Hillock..... 845
Gun, Naval, Mounted on Railway Carriage... 851
Kaiser Wilhelm and Emperor Charles..... 854
Railroad Cars, Armored, with Naval Rifles... 850
Refugees in Northern Italy..... 852
Serbians Hung by Austrians..... 854
Smoke Stick, Using to Screen Troop Movements 850
Soldiers at Rest, Play, and Work..... 846
Tank, Heavy Duty, Used by French..... 851
Tank of American Design..... 845
Trench Digging Machine..... 850
Views from Italian Front..... 848
Warehouse, Immense Government, in South Boston 909
Water System, Double, Proposed for Cities..... 897
Whistle, Electric Steam, Aids Logging Men.... 890
Window, Self-Locking, Has No Counterweights.. 859
Window Washers, Folding Safety Guard for.... 895
Wool, Crossbred, Process Makes Use Practical. 856
Yarn Reel, Knockdown 887

SHOP NOTES.

Alcohol, Wood, Distinguished from Denatured. 937
Automobile Radiator, Leaky, Quickly Repaired 928
Automobile Radiator, Thermometer for Water Cooling System 940
Automobile Timer and Magneto, Oiling Properly 926
Automobile Wheels, Gauge Stick for Alining.. 937
Automobile Wheels, Removing from Axle..... 938
Automobiles, Creeper for Use Under..... 927
Blowtorch Furnace, Old Piston Used as..... 941
Blowtorch Made of Oilcan and Bicycle Pump.. 939
Cane Chair, Method of Planing..... 937
Cement, Acid Proof, for Pipe Fittings..... 939
Clamping Device, Adjustable, for Shop..... 938
Concrete Highway Construction, Wooden Roller Aids 939
Corrugated Fasteners Made with Meshed Gears 939
Dowel Cutter for Home Workshop..... 934
Drafting Table, Bench for..... 935
Drill for Enlarging Bottom of Threaded Holes... 935
Electroplating Inside of Tube or Casting..... 926
Emery Grinder Made into Power Machine in Lathe 933
Eye, Removing Foreign Particles from..... 936
Fans Belted from Mill Shaft Give Comfort to Workmen 925
Files, Old, Treated with Acid..... 937
Fuses, Emergency, Rack Holds..... 942

[Contents Continued on Page 8]



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(Contents—Continued from Page 6)

Gears, Split, Tongs for Handling 928
Hammer Handles, Prolonging Life of 942
Harpoon Gun Made from Old Rifle 925
Hog House of Saw Tooth Design 923
Iron Surfaces Copperized 928
Monoplane, Scout, Part II 929
Motorcycle, Head Fitting and Bar Fastening Repair for 926
Motorcycle Piston, Broken, Repair for 924
Nails in Hardwood, Handy Tool Drives 936
Oil Discharged by Pressure 934
Paper Ornament Making Machine for Restaurant Use 924
Paraffin for Woodworking Tools 935
Photographic Negative Glass, Old, Exploiting 927
Pipe, Sections of Connecting 940
Round Recesses Cut with Homemade Tool 936
Rulers, Weighted, Hold Drawings 941
Sandpaper Files Handy in Woodwork 925
Scraper Handle, Homemade 941
Screens, Window, Fastening with Stove Bolts 938
Sheet Metal, Cutting Disks or Rings from 942
Smokestacks, Blasting Soot from 934
Solder, Dripping, Shield Protects Hand from 940
Stethoscope for Telephone and Auto Use 941
Switch, Motor Starting and Regulating 927
Tapeline Holder does Not Snag 935
Twine Cutter Made of Wood Screw 939
Vise or Wrench Tool for Bench Use 942
Vise, Wooden Caps Convert into Bench Clamp 938
Wheel, Large, Turning in Small Lathe 940

AMATEUR MECHANICS

Advertisements on Sidewalk with Projected Light 957
Automobile Radiator, Hot Water Bag for Filling 953
Automobile, Ventilation Provided by Additional Door 948
Baseball, Indoor, Played with Fruit Jar Rubbers 953
Bathtub, Trunk Serves as 956
Bells, Changing Tone of 952
Birds, Hunting with Camera 949
Cameras, Lens Caps for Made of Tin Covers 956
Card Selection Trick, Mechanical 950
Checkerboards for Soldiers and Sailors 945
Crab Nets, Indicator for 955
Egg, Magnetic, Affords Amusement 958
Evaporator for Fruits and Vegetables 947
Garden Cultivator, Homemade 959
Gauge for Drilling Holes in Wood 958
Gun Rack for Canoe 953
Hotbed Frames Guarded by Wire Support 955
Lamp Shade, Cardboard, Resembles Brass 957
Lathe Problem, Amateur Solutions of 943
Lung Tester, Calibrated, Affords Amusement 946
Match Holder, Mouse Proof, Made from Carton 959
Medicines, Sick Room Indicator Tells Time for 946
Mucilage Jar Made into Double Inkstand 958
Overall Buttons Made into Bill Posting Tacks 959
Phonograph, Disk, Electric Device Stops 948
Photographic Dark Room, Ventilating 954
Potatoes, Roasting in Camp Fire 946
Razor Sharpening, Emery Compound for 950
Refrigerator Indicator Tells Amount of Ice Wanted 951
Rugs and Carpets, Nonsagging Hanger for 946
Saw, Attachment for Aids in Felling Trees 945
Screen Door, Guard Strips Protect Wire of 956
Seeds, Box for Testing 945
Smokehouse Made from Barrel 947
Solar Eclipse, Optical Box Aids Observation of 954
Stove Lid, Burned Out, Repair for 945
Stoves, Oil or Gas, Cones on Save Fuel 958
Striking Bag Disk Made from Bicycle Rim 951
Typewriter, Metal Cups Hold in Place 957
Valve Spring Compressor, Pliers Made into 952
Ventilation, Rope and Pulley Aid 954
Watch Stem, Clip for Prevents Setting 957
Window Shade Brackets, Old, Uses for 951

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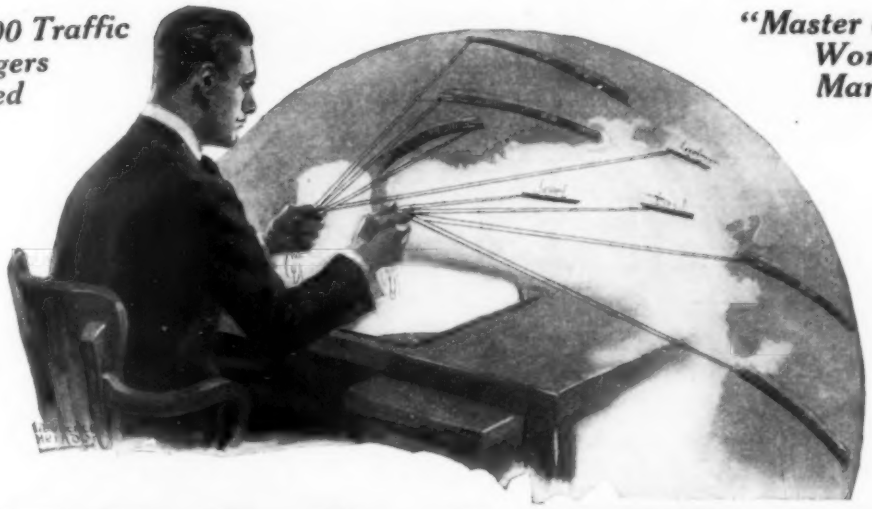

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We give you individual coaching and train you by our "Experience" method. You will be put in touch with more than 300 big traffic managers, belonging to this association. These men are connected with big railroads—steamship, manufacturing and shipping concerns of the U. S. You will in a short time acquire the same valuable knowledge, gained by the experts only after a life-time of hard work and tedious study. With your membership you will get FREE our Fifteen-Volume Traffic Management Digest, prepared by these experts at a cost of nearly $75,000 and which took more than five years to prepare.

Write Today

Write us now for full information on the new profession of traffic management and particulars of our course. Simply send your name and address. All information sent free and postpaid. Write today—**now**, while you are thinking of it. Mail the coupon or letter or postcard.

AMERICAN COMMERCE ASSOCIATION

Dept. 106, American Commerce Bldg.

CHICAGO, ILL.

SUCCESS!

C. H. Wanamaker, after working 10 long years as a telegraph operator decided to better himself and took up our traffic training. He had not even completed the course before he secured a position with the United Piece Dye Works of Lodi, N. J. at a salary to start of $3,000 a year! Every day there come to us stories of how our students are securing high-salaried traffic positions all over the country. You can attain the same success. Let us show you how easy we make it for you.

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Send me FREE and without obligation complete information concerning the Association and how I can train as a traffic man.

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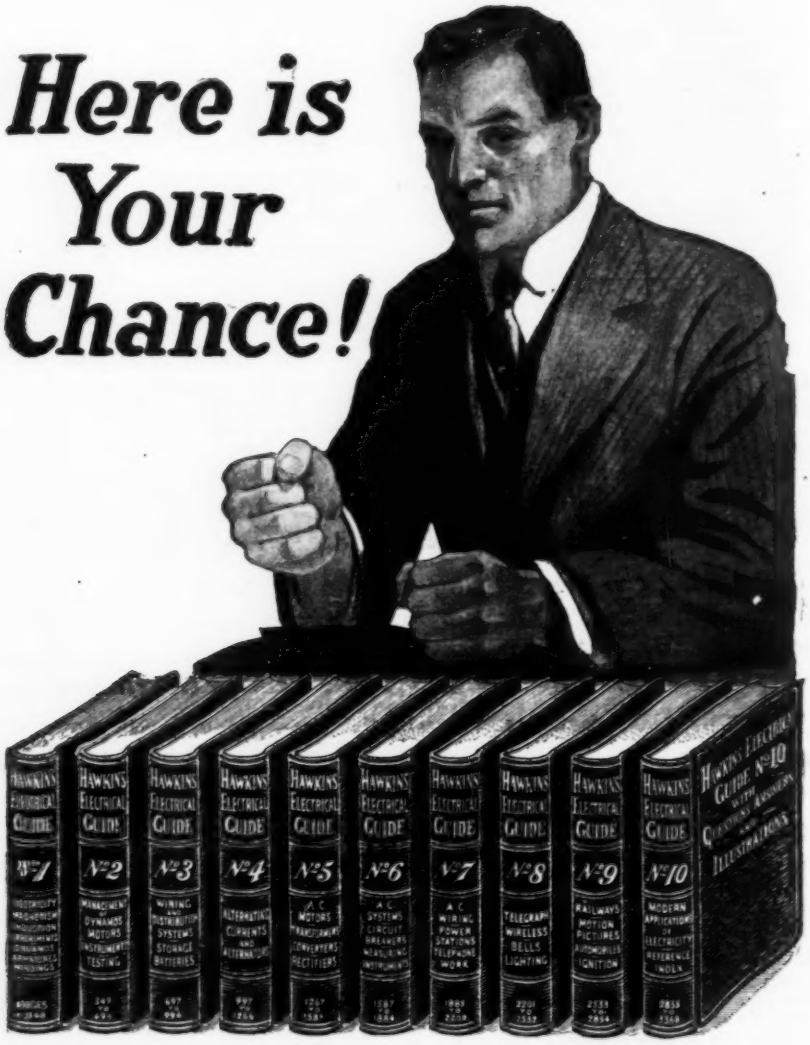
HAWKINS ELECTRICAL GUIDES



Get Bigger Pay *through* ELECTRICITY

Please Mention Popular Mechanics

HAWKINS ELECTRICAL GUIDES

are a necessity in the daily work of every Electrician, Mechanic, Engineer and Electrical Student.

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Just think how much these books will help you. In Hawkins Electrical Guides you always have at hand for immediate reference or study, a wonderful work containing 4,700 illustrations and 3,500 pages which cover all the subjects, principles, theories, practices, problems, troubles and ways of doing things electrically. All subjects are indexed so that you can find the information instantly. Written in the modern question and answer form. It's like having a famous electrical authority always at your elbow ready to answer any question you ask.

$1 A NUMBER—$1 A MONTH

You need specialized knowledge today if you are to master electrical forces and command the high salary of an electrical expert. Success in electricity will come through your ability to acquire and use the specialized knowledge of others—knowledge collected and condensed in Hawkins Electrical Guides.

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3,500 Pages—4,700 Pictures
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The Guides fit your pocket. You can carry a number about with you till you have mastered its contents. Bound with flexible covers, gold title and edges, they are truly *beautiful* books. Well printed in large type on high grade paper they are a *pleasure* to study and possess.

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No. 1 Contains 348 pages, 388 illustrations. Electrical signs and symbols—static and current electricity—primary cells—conductors and insulators—resistance and conductivity—magnetism—induction coils—dynamo principles—classes of dynamos—armatures—windings—commutation—brushes, etc.

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Please submit me for examination Hawkins Electrical Guides (price $1 each). Ship at once, prepaid, the 10 numbers. If satisfactory I agree to send you $1 within seven days and to further mail you $1 each month until paid.

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SIMPLIFIED Stenography

"Talk as fast as you like, I am taking it down in K. I. Shorthand."

READ THESE AMAZING—absolutely logical—**FACTS ABOUT K. I. SHORTHAND.** This is a simplified system of stenography easily learned in a few hours, after which speed in writing comes with ordinary usage.

The old systems of shorthand are all right but are unnecessary for most of the practical purposes of life. By comparison you might solve a problem, ***using logarithms,*** that could be done more quickly and easily by ***simple arithmetic.*** In certain countries, a ***knowledge of engineering*** gained by intensive study for two or three terms is necessary to entitle a person to operate a motor boat, yet here in America, even a girl or boy is able to run such a boat after a few hours of study and practice. Similarly with stenography—the **simplified K. I. Shorthand** enables a person, young or old, to sweep aside old-school restrictions and do practical stenography in an amazingly short time.

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The system of K. I. Shorthand is the original and can be obtained solely from King Institute at the exceptionally low cost of **FIVE DOLLARS.** Nothing further to pay and special instruction given without charge by correspondence, if needed after you have obtained the Course of Instruction. **No such privilege given with any other low cost method.**

Test for yourself the simplicity of K. I. Shorthand and the ease with which you learn by trying the short lesson below. The whole course is equally fascinating. It is a common remark for patrons to say they do not need to study—they ***absorb***—this wonderfully superior **easy-to-learn K. I. Shorthand.**

Learn K. I. In 5 Evenings

WHY SO EASY TO LEARN

TRY THIS LESSON

Here is *a* ∘ Just a tiny circle This is *t* |

So here is *at* ⌉ Here's *k* —

act ⌐ Spelled as pronounced *cat* (kat) ⌐

ng or *ing* ⌣ *acting* ⌐⌣

TO WRITE "ACTING" IN THE ORDINARY WAY REQUIRES 21 PEN MOVEMENTS—ONLY 4 IN THE PERFECTED AND SIMPLIFIED K. I. SHORTHAND.

See how easily you have learned to use four signs in K. I. SHORTHAND. Quickly, like a pastime, you can learn the whole set of 30 and then **attain speed** so you may write in a quarter to a tenth of the time needed for writing in the ordinary way. Thus you may **write as rapidly as the words are spoken.**

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You can read your own notes—transcribe everything—word for word, accurately, weeks, months or years afterward. Your assistant can quickly learn to read and typewrite your notes.

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All superfluous technicalities eliminated; they are as unnecessary for all ordinary purposes as is the knowledge of trigonometry or ancient Greek language.

KING INSTITUTE 154 E. 32nd St., NEW YORK 8 So. Wabash Ave., CHICAGO

A PROVED SUCCESS for Practical Purposes

Men and women—make use of K. I. Shorthand in your vocation, or avocation. Simplify your work—make notes rapidly. Take down important communications of callers, including telephone messages. Take down lectures. Keep a diary now.

Boys and girls—learn to earn. After easy practice you are able to occupy good paying positions. Wages of stenographers were never so high—never such a demand. Stenography opens the gateway to big opportunities.

Manager and employees—add to your efficiency and income. Make notes at conferences and keep confidential memoranda. A wealth of added ability for an investment of only $5 plus spare time practice.

Try These K. I. Shortcuts

Association

This word takes 34 pen movements in ordinary writing—only 2 in K. I. Shorthand. See how many times you can write it while your friend writes in the usual way.

Notwithstanding

Takes 54 movements in longhand; only 3 in K. I. Shorthand. The whole method is surprisingly easy to learn.

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Takes 41 movements in longhand; only 2 in K. I. Shorthand. Learners, all ages, are delighted with their quickly attained speed.

SHORTHAND Complete $5.00

The photo here shown is of Naval Radio Operator E. B. Scribner who acquired the principles of K. I. Shorthand in a few hours and soon became able to use it in his naval service work. There are many writers of K. I. Shorthand in Army and Navy.

USED BY MANY MINISTERS

"I rarely was so pleased with anything in all my life as K. I. Shorthand. I learned it in ten hours." Rev. J. B. Dinkins.

"Have had the lessons 4 days and am now able to write anything." Rev. N. N. Faurot.

"Am now writing sermons in K. I. Shorthand with surprising economy in time; no trouble to read my writing perfectly." Rev. John Fahey.

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"I learned the main part of K. I. Shorthand in an afternoon. It is great value for five dollars." W. J. Gibbs.

"After spending less than three hours in studying your method, I can write any word in the English language." B. Diver.

"After having studied K. I. Shorthand about two weeks, I can write at speed of 75-82 words per minute." James Foleno.

"So simple a child could learn; I have been fascinated with it." Georgia L. Ferguson.

TEACHERS ENDORSE K. I. SHORTHAND

"As a teacher, instructing in K. I. Shorthand, I find it a splendid system having the great advantage of being so easily acquired." M. G. McClernan.

"My school pupils are learning your method quickly and they not only write rapidly but even I can read their notes easily." Miss H. R. Noble.

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"I cannot say too much in praise of your system. It is the simplest, easiest and most practical quick home study course that it has been my pleasure to examine." Elmer Duffy.

"I did not study your system; I absorbed it. A great pleasure, a time saver, a blessing." Dr. Paul E. Winger. (This came to us written in K. I. Shorthand.)

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"Have acquired speed averaging 110 words per minute in five weeks." Minnie H. Evans.

Note: Voluntary testimonials are constantly coming to King Institute. A plenitude, with full addresses, will be mailed with our FREE BROCHURE on request.

King Institute

8 So. Wabash Ave. CHICAGO

154 East 32nd St. NEW YORK

30 DAYS TRIAL

If, after having had the K. I. Shorthand System for 30 days you cannot learn, the small sum that you have paid—$5.00—will be refunded. King Institute is incorporated, authorized capital $100,000.00 and you take no risk. Ours is an incomparable offer.

Send $5.00 in full payment. Or, if more convenient—to save time—mail $1.00 now and you may pay $4.00 when the Course of Instruction comes to you.

Bear in mind, we claim that the K. I. Shorthand System is relatively worth fifty dollars and we are teaching this registered fully copyrighted, guaranteed method for only one-tenth its value which you can learn in less than a tenth of the time of most other stenography systems.

Make money-order or check payable to King Institute. Or send cash. Mail your order to either of our offices, 154 East 32nd St., New York City or 8 South Wabash Avenue, Chicago. Be sure to mention Popular Mechanics.

At the Lecture

Use the Coupon below or write a letter—as you prefer—but don't delay in taking advantage of this opportunity. The best $5.00 investment you ever could make.

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8 So. Wabash Ave., CHICAGO, ILL.

Send me the complete K. I. Shorthand System in accordance with your offer.

☐ *I enclose $5 in full payment.*

☐ *I enclose* $1 and will pay the balance, $4, when the K. I. Shorthand System comes to me.

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Training for the Head and Hand

Come to Detroit
The Automobile Center and
LEARN THE AUTOMOBILE BUSINESS

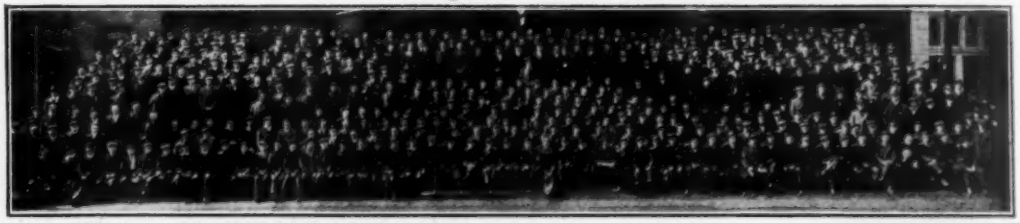
DETROIT trained men get preference and get jobs quickly. No other city can give what Detroit does with its more than 184 large Auto and accessories factories. Think what it means to learn in the Michigan State Auto School. Factories endorse our school, glad to employ our graduates. Unlimited opportunities. 71% of Automobiles are made in Detroit. You're right in the Heart of the Auto Industry. Men are needed everywhere as testers, repairmen, chauffeurs, garage men and salesmen. Hundreds of our graduates start in business for themselves.

Earn $75 to $300 a Month

We teach you to handle any auto proposition. You graduate in from ten to twelve weeks. Equipment is new, up-to-the minute, complete. No old, obsolete motors, chasses or electrical equipment used. Students actually build cars from start to finish, getting factory training in assembling, block-testing, road-testing, everything. Special complete course in Oxy-Acetylene brazing, welding and cutting, separate from regular course.

Also complete course in Tire Repairing separate from Auto Course. Learn to time motors, rebore cylinders, adjust carburetors, magnetos, valves and bearings quickly and accurately. Six-cylinder Lozier, Chalmers "6," Detroiter "6," Overland, and 8-cylinder King are used for road instruction. We have 25 motors in our block test department—2 cyl., 4 cyl., 6 cyl., 8 cyl., and 12 cyl., including Packard Twin "6" and Willys-Knight. Our electrical department is complete, having every standard starting, lighting and ignition system, including Delco System as used in Buick, Hudson, and Packard Twin "6."

Follow the Crowd to the Michigan State Auto School. Come to Detroit



This is one of the 1917 classes. Over 200 of our students were not in the picture

Detroit Is the Place to Learn—Start Any Time

There are 44 auto factories in Detroit and vicinity and 140 accessories and parts factories. Our students have the privilege of going through any or all of them. Students get actual experience in handling all kinds of electrical auto equipment and taking care of trouble. We have a Sprague Electric Dynamometer for block-testing purposes for students' use. Ours is the only Auto school having this equipment. Factories and garages are paying big salaries to men who know how to handle electrical equipment quickly and properly. There is a great demand for Michigan State Auto School students. School open all year. Enter classes any time, any day. Three classes daily: morning, afternoon, evening. All instructors are members of the Society of Automotive Engineers (S.A.E.).

Not a One Man School

This school is founded on the best, most practical and newest principles in the Automobile, Aeroplane and Tractor business. It is the result of the keenest co-operation with manufacturers, service stations, garages and owners. It is not **one man's idea** but the ideas of the biggest, best and most successful men in each field.

A. G. Zeller, President

Automobile Factories Endorse Our School

The Leading Automobile factories in Detroit, as well as in other cities, endorse our school. They are putting their latest model, complete chasses in our school, and employing our graduates in their factories and service stations and assisting them in opening garages and salesrooms. They allow our students to go through their factories.

Women Take Courses

Many ladies have taken our course and are making good. They are holding good positions and are completely satisfied with our instructions and the courteous treatment accorded them. They receive the same work as given to men. They can enter classes any day.

Act Quickly—NOW!

Fill in the coupon; get literature on Aeroplane Motor Mechanics, Auto and Tractor Course, Tire Repairing, Brazing and Welding, "Auto School News" and New 176-Page Illustrated Catalog. All absolutely free. Or better still, jump on the train, as hundreds have done, and come to the "Heart of the Automobile Industry," and learn right. We have no branches. Write or come direct to this school.

MICHIGAN STATE AUTO SCHOOL

The Old Reliable School **A. G. ZELLER, Pres.**

306 Auto Building, 687-89-91 Woodward Ave.

DETROIT, MICH., U. S. A.

Money-Back Guarantee

We guarantee to qualify you for a position as chauffeur, repair man, tester, demonstrator, auto electrician, garage man, automobile dealer, Aeroplane motor mechanic or tractor mechanic and operator, paying from $75 to $300 monthly or refund your money.

SEND THIS COUPON TODAY

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306 Auto Bldg., 687-89-91 Woodward Ave.
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Gentlemen: Please send me, absolutely FREE, New 176-page Illustrated Catalog, "Auto School News," and information as checked below.

[ ] **Auto and Tractor Course** [ ] **Tire Repairing** [ ] **Brazing and Welding** [ ] **Aeroplane Motor Mechanics**

Mark each course you are interested in.

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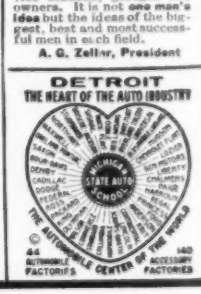
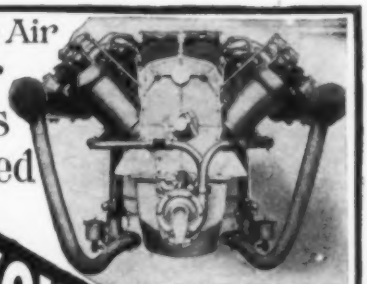


PREPARE TO SERVE YOUR COUNTRY

The War Will Be Won In The Air

Aeroplane Motor Mechanics Needed



CURTISS 200 Horse Power Aeroplane Motor

We have secured a Curtiss Aeronautical Motor for practice and study purposes. We also have a complete Aeroplane and a great quantity of the aeroplane material. Students will be given practical instruction on the Aeroplane motor and will secure complete knowledge of the plane in general. The course is under direct supervision of a thoroughly experienced aeroplane man who is an authority on aeromotors and aeroplanes as well as hydros and flying boats. This course is entirely separate from our Automobile Course.

The Eyes of Our Army

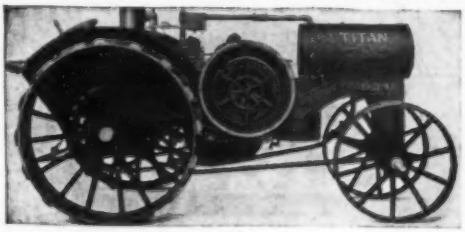
Aeroplanes will win the war. They are the eyes of the army. They must be in perfect running condition. Thousands of keen, well-trained men are needed by the Government to care for the aeroplanes and aeroplane motors. Men are needed in the aeroplane factories. Trained Aero-motor mechanics will get the preference.

Get Into New Industry

The men who become trained Aeroplane Motor Mechanics now will be big men in the aeroplane business. The aeroplane business is in its infancy. The war has given it a big start. The men who train now will be the Big Men in the near future. The work is interesting. The far-sighted keen fellows who enter at once will reap the big benefits. Write now for literature, use coupon on opposite page.

Complete Tractor Instructions Added to Auto Course

Our complete Automobile Course has always included all the instructions necessary to handle Tractors. By adding the I. H. C. Titan 10-20 complete tractor for actual working conditions and a complete engine and transmission for the block test department we are training our students in the care, repair and operation of the Tractor. The Oliver Chilled Plow Works of South Bend, Ind., placed their No. 78 automatic lift three bottom tractor plow in our school for student work. When students leave our school they are trained in every branch of work and can repair, maintain and operate Automobiles, Trucks and Tractors. We have not a separate tractor course but have added the tractor work to the complete Auto Course.



Get Into Auto, Truck and Tractor Business Now

Never before have such opportunities been held up to trained men. With thousands of men taken from the Auto Industry for Army work, with more money in the country than ever before in the history of the world it is possible to enter this business and make a "clean up" easily and in a short time. Automobiles and Trucks will be used more and more because of the congested freight and passenger traffic conditions. Farmers are buying Tractors faster than the manufacturers can make them. All of the Autos, Trucks and Tractors must be operated and cared for. The trained mechanics will get the preference. The men who are trained will make the most money selling these motor driven machines. Get into this business NOW, the future was never so bright. Get your training in the original practical school. Train both the head and hand.

Autos—Trucks—Tractors on Farm

Every farm should have a Michigan State Auto School graduate on it. Farmers are buying Autos, Trucks and Tractors and they realize that it is the best plan to have a **trained** mechanic to keep their machines in proper running condition. Machines last longer and do better and more work when they are operating just right. With the high price now paid for farm products the farmer is operating his farm with gas engines and using fewer horses. A course in the Michigan State Auto School will pay for itself many times in a year. Better start NOW.

International Harvester Company of America
(Incorporated)
Harvesters and Other Lines of Machinery
Harvester Building

CHICAGO, November 20, 1917.

MR. A. G. ZELLER, President,
Michigan State Auto School, Detroit, Michigan.

DEAR MR. ZELLER:

After a very careful examination of your school, we are satisfied that it will be a very wise thing for us to co-operate with you. We are therefore placing in your hands, for instruction purposes, one of our Titan 10-20 tractors, together with an engine completely equipped for block test and a complete transmission.

We are ready to co-operate with you in the excellent work you are doing by giving your school all the data and information not only on tractors, but on conditions generally that can be used in developing thoroughly practical, efficient tractor operators and mechanics.

Your practice of co-operating with the factories is very commendable, for it brings together the biggest men and most successful ideas to be had. As you know, there is an urgent demand for tractor men who are trained and efficient. War has taken thousands of men from the farms and these men will have to be replaced, and thousands more will be needed to care for the big crop increases.

We will gladly co-operate with the Michigan State Auto School through our ninety branches in the United States in placing your tractor graduates. There is a constant demand for competent trained tractor men at very good wages.

Very truly yours,
INTERNATIONAL HARVESTER COMPANY OF AMERICA
Signed by F. W. Heiskell, Advertising Manager.

Serve Uncle Sam As a Trained Mechanic

Conscripted men can serve Our Country to a better advantage if they are trained. Thousands of trained men are needed at once for service "Over There" and "Over Here." Men who are not conscripted may join the army and see service soon. Several departments of the Army and Navy want trained motor mechanics. The trained men get the advantages and advancement. It is possible to get into service at once and see action soon. Don't hesitate but come at once. If you are "called" we will make a refund—but it is very possible that men in training will be allowed to finish their work—for **trained** men are needed badly. **Use the Coupon on the Opposite Page—NOW!**

The Old Reliable School **Michigan State Auto School** A. G. ZELLER President

306 Auto Bldg., 687-89-91 Woodward Ave. **DETROIT, MICHIGAN, U. S. A.**

$1000.00 FOR A SINGLE DRAWING

THINK of it! $1,000.00 for a single commercial drawing! Leading illustrators and commercial artists frequently receive this much, and *more* for single pictures or designs, and their work is eagerly sought.

Every one may not achieve their remarkable success, yet it is a true index of the splendid opportunities ready and waiting *today*. The never-satisfied cry of the modern business world is "more *trained* commercial artists." Thousands of advertisers, periodicals, publishers and others buy millions of dollars' worth of designs and illustrations every year. If you like to draw, *develop your talent into a high-salaried ability*. The Federal Course is a Proven Result-Getter. You, too, should succeed, *with the proper training*.

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These men, commanding splendid yearly incomes, have won their fame *by persistent study and training*. Federal Training alone now brings to you the experience, instruction and inspiration of their true success. *Exclusive original lessons especially prepared by them are included in the Federal Course.*

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FRANKLIN BOOTH, "Painter with the Pen." His wonderfully rich and decorative pen-and-ink designs are constantly appearing in magazines.

EDWARD V. BREWER, Advertising Illustrations. His work for Winchester Arms and "Cream of Wheat" displays his excellent color values.

E. F. BAUER, Engraving. President Federal School of Commercial Designing.

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CHARLES E. CHAMBERS, Magazine and Story Illustrator. Everyone knows his drawings for "Get-Rich-Quick Wallingford" in Cosmopolitan.

LAUROS M. PHOENIX, Dean of the Federal School.

J. H. MITCHELL, General Advertising. President, Mitchell Advertising Agency, Minneapolis.

JOSEPH ALMARS, Director of Education. Much credit is due to him for America's Foremost Course in Commercial Designing.

COLES PHILLIPS, Contributor. His magazine covers and advertising illustrations are nationally known.

GET THIS SPLENDID BOOK, "YOUR FUTURE"

Every ambitious young man and woman should read this book. It will wake you up to the splendid opportunities for *modernly trained* commercial artists, both men and women. *In this profession a woman is not handicapped—she is as well paid as a man with equal ability.*

"Your Future" a beautifully illustrated 56-page book, shows remarkable work of Federal students. It describes the Federal home-study Training, endorsed by illustrators and Commercial Art studios of national repute. It will gladly be mailed to you free—just send the coupon below.

Coupon for "Your Future"

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GENTLEMEN:—Please send me "Your Future" without any obligation to me.

Name.....

(Write your address plainly in margin)

NEW ELECTRICAL DISCOVERIES

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(P 96)

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$6500 a Year After Learning Salesmanship at Home!

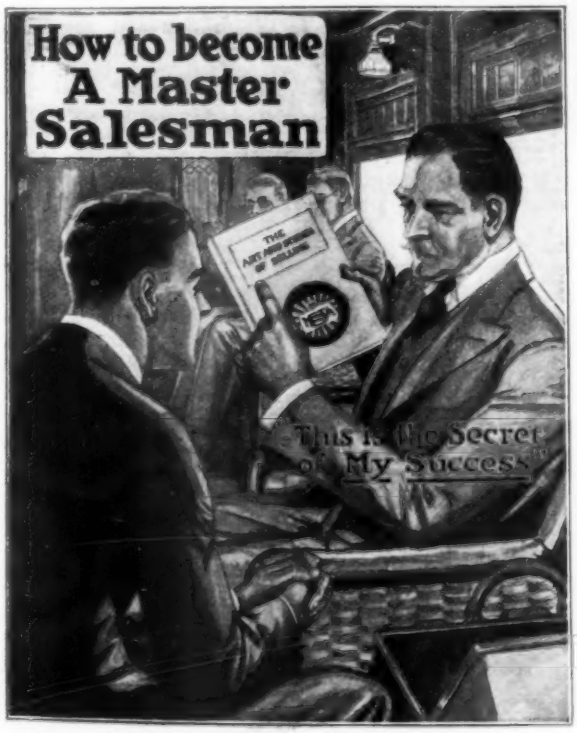
A hint of the possibilities for Clerks, Bookkeepers, Mechanics and others in the Field of Salesmanship

By M. B. Sackheim

C. W. BIRMINGHAM formerly earned $800 a year as a material clerk in a factory. He wasn't satisfied with this small salary, so he began to look around for some line of work which would pay him a better income. After going over the field, he decided that the quickest rewards could be won through salesmanship.

In his investigations, he found that salesmen, as a class, are much better paid than the average; that they always wear good clothes; that they have the choice of travelling throughout the country, or working at home; that they come in contact with the biggest men in the various organizations they call on; and that the possibilities for advancement are exceptionally good.

But Mr. Birmingham knew nothing whatever about Salesmanship. One day, however, he wrote to the National Salesmen's Training Association, and found that Salesmanship is just as much a matter of training as any other profession. He found that Salesmanship in itself was an Art that could be applied to the selling of any line of merchandise.



After a short period of study, Mr. Birmingham went on the road and was so successful that after earning $6500 a year as a salesman he was promoted to Sales Manager.

If this were an exceptional case, the work of the Association would be worth no more than passing notice. But there are hundreds of other men, both young and old, who have taken the Instructions issued by the Association and have met with universal success. For example, a man in San Francisco who was formerly a carpenter, is now in the $5000 a year class as a salesman. A former $15a week clerk is earning more than $100 a day as a salesman. An office clerk in Chicago jumped to earnings of $3000 a year as a salesman. A former railroad employee who earned $75 a month is earning as high as $375 a month as a salesman. Another man, after six months of successful selling, secured a position which pays him $92 a week. Still another man, who had no former experience in selling, and who never earned more than $60 a month, turned to salesmanship and earned $524 in two weeks.

These are but typical instances of what it means to become a star salesman, with the help of the Association's intensive training. And there is no time like now to become a star salesman. Billions of dollars' worth of merchandise must be sold by American industries during the present year. After the war, when normal industries are revived, there will be an even greater demand for salesmen. Equip yourself now by mail, in part of your spare time to enter this profit-producing business. It is not necessary that you have any previous experience, for the Association trains you from the bottom. The Course is the result of many years spent in selling and in training thousands of successful salesmen. The nine volumes, containing more than fourteen hundred pages are used as a text-work in connection with the instruction in the Art and Science of Selling. The price is within reach of every poorly paid worker.

A feature of the Association's work is the free employment service. Practically every line of business is included in the requests received for men and women to fill many thousands of sales positions. N.S.T.A. employment service with each complete Course supplements the training by practical help in securing a position.

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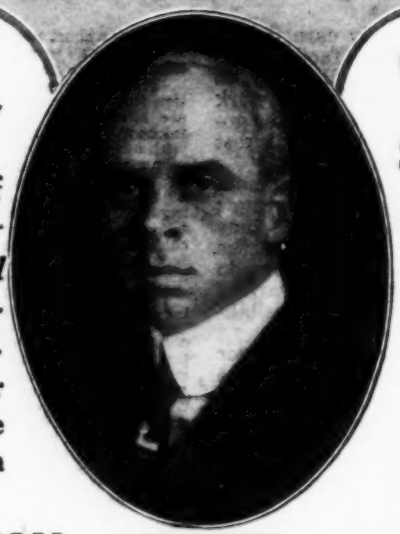

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YOU Earn $1,500 Upwards Yearly. Learn Real Estate brokerage. You can absolutely master this exceedingly profitable profession in a short time by the study of our invaluable and highly recommended publications, two of the most important being listed as follows: "How to Sell Real Estate" cloth 272 pp. 12 mo. $2.50; "How to Conduct Real Estate, Ins., and Gen. Brok. Bus." Buckeye, $1.00. Order now. Absolute satisfaction guaranteed. Free catalogues. Realty Book Company, Dept. 20, Cleveland, Ohio.

100 FORMULAS, including Luminous Paint; Egg Substitute; Resilvering Mirrors; Renewing Dry Batteries; Gas Tonic, 25c. "The Ideal," Box 543-FB, Chicago.

ORGANIZE Your Own Health and Accident club; 22 members; best and cheapest protection; no experience nor capital necessary; 3,200 clubs already organized; agents wanted. Fraternal 22 Club Co., 411 Central Bank Bldg., Topeka, Kansas.

"KNOCK the Helmet off the Kaiser" and "The Royal Neck Stretcher." Latest and best games for parks, carnivals and resorts. Big money-makers. Small investment. Penn Novelty Co., 908 Buttonwood St., Philadelphia, Pennsylvania.

WE start you in business furnishing everything; men and women make handsome income weekly operating our "New System Specialty Candy Factories" home or small room anywhere; no canvassing. Opportunity lifetime; booklet free. W. Ragsdale Co., East Orange, N. J.

I WANT to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 6 N. Michigan Ave., Chicago.

AGENTS coining money selling California Rosebeads. Big profits. Write for proposition. Mission Bead Co., BP2819 West Pico, Los Angeles, Calif.

ADVERTISERS, Mail Dealers. Our New Rate Book lists 2,000 Principal Publications, rates, circulation. Includes 30 Mail-Order Plans, Free. Dearborn Advertising Agency, 210 Franklin Bldg., Chicago.

INVENTORS: Write Fisher Mfg. Co., 2061D Railway Exchange, St. Louis, Mo.

BE a Manufacturer! Buy and market a practical invention and make money. Write Fisher Mfg. Co., 2061DD, St. Louis, Mo.

INVENTORS: We develop and perfect inventions, make models, dies, tools. Metal stamping and special manufacturing. Gerding Bros., Lion Bldg., Cincinnati, O.

EXPERT Chemical Service. Commercial Analysis, Instructions, Formulas, Processes and Trade Secrets. Manufacturing problems solved. Satisfaction guaranteed. Write for Lists and Valuable Information. W. L. Cummings, Ph. D., 127 Standart St., Syracuse, N. Y.

PATENTS That Protect. Write for free books. Highest references. Best results. Watson E. Coleman, Patent Lawyer, Washington, D. C.

$50 STARTS you making $200 to $500 monthly as branch manager and district distributor for new line of automobile necessities. Local and mail order business. We furnish goods, stationery, advertising, postage, etc. W. H. Roose, President, 189 Ovee Bldg., Louisville, Ky.

YOUR Idea Wanted. Patent your invention. I'll help you market it. Send for 4 free books, list of patent buyers, hundreds of ideas wanted, etc. Advice free. Patents advertised free. Richard B. Owen, Patent Lawyer, 30 Owen Bldg., Washington, D. C., or 2276R Woolworth Bldg., New York.

ENTER a new business. Earn $3,000 to $5,000 yearly in professional fees making and fitting a foot specialty, openings everywhere, with all the trade you can attend to; easily learned by anyone at home in a few weeks, at small expense; no further capital required, no goods to buy, job hunting, soliciting or agency. Address Stephenson Laboratory, 11 Back Bay, Boston, Mass.

MAKE Marvello Wizard Washing Tablets. No Wax, Lime, Lye or Potash. No Machinery required. Material obtainable anywhere few cents pound. Brings sixty. Particulars, Valuable Formula Lists Household and Automobile specialties for Stamp. Miller, Analytical Chemist, Tampa, Florida.

SILVERING Mirrors! My exclusive French Tartaric method opens enormously profitable business. Booklet Free. H. Barstow, 514 23rd Street, Oakland, Calif.

MANUFACTURERS, Promoters and Patent Buyers are invited to write us stating the line of invention in which they are interested, as we can supply their wants in any class of patents. Victor J. Evans & Co., 162 Ninth St., Washington, D. C.

BIG New Book for Boys—The Boy Mechanic, Vol. II—Just Out—A sequel to, but containing nothing found in Vol. I. Tells all about 1,000 interesting things to make and do. 480 pages; 995 Illus. Cloth. Price, $2.00, postpaid. Send for descriptive circular. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

GO in to business for yourself or use it at home. Waterless Washer Soap removes grease from your hands without water. Cleanses most everything. Most wonderful soap ever manufactured. We supply you 2 pounds of ingredients which makes 16 lbs. of soap. Only hot water required. Indispensable for home or machine shop. Send 3c stamp for full particulars. Waterless Washer Laboratories, 2128 Michigan Ave., Chicago, Ill.

BUSINESS FOR SALE

FACTORY. Goods sells to stores. Established three years. 100% profit. Money-maker for hustler. Sons drafted, reason. Price, $350. Mohler, 918 First National Bank, Chicago.

TO MANUFACTURERS

WILL buy—Small factory manufacturing automobile accessory that sells. Crum Mfg. Co., Ottawa, Kans.

MANUFACTURER of Wire, Wire Forms and Springs. Thomas Hamilton, 2140 N. Carlisle St., Philadelphia, Pa.

MAIL-ORDER SUPPLIES

INCREASE your sales. Place your proposition before the readers of "Cartoons Magazine," 20,000 copies guaranteed every month. Classified rate 5c per word. Mail in a trial ad today. Cartoons Classified Dept., 78 E. Madison St., Chicago.

FOR ADVERTISERS

PRINTED Pencils Pull Business. Stamp. Grayville & Co., Lancaster, Pa.

I WANT to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 6 N. Michigan Ave., Chicago.

SPECIAL: Inch display advertisement 100 Magazines thrice, $8. Universal Syndicate, Atlantic City.

LETTER SPECIALISTS

EFFECTIVE, Agent-Getting Sales Letters, $1. Colonial Company, Woodhaven, N. Y.

FORCEFUL Sales Letters $1. Jacobus Advertising Service, 1073 Sanford Ave., Irvington, N. J.

AGENTS WANTED

NEW patriotic pictures in colors. Sample free. "Colored Man no Slacker." "Love of Freedom." "Duty Calls." "Pershing in France." "Berlin or Bust." "Kaiser's Finish." "Over the Top with Uncle Sam." "Over There," and many others. Also portrait catalog free. Consolidated Portrait Co., Dept. 6, 1029 W. Adams St., Chicago.

AGENTS! Sell "My Military Record." Soldiers, relatives, friends are prospects. New, big seller. One agent ordered 11,220 books. Big profits. Money-maker. Sample 75c. Money back if you want it. Particulars free. Mohler, Box 453, Chicago.

EGGSAVER—Replaces eggs in baking and cooking at 10c dozen. Big seller. Sure repeater. Write quick. Reinshagen, 906a Webster Bldg., Chicago.

EVERYBODY—Get this quick! Stirring patriotic novelty for windows, stores. Sells on sight. Large profits. Big sample 10c. Particulars free. Woodward, 1213 Broadway, Cincinnati, Ohio.

BIG Profits manufacturing your own goods. No machinery. Valuable Formula. Catalog free. Bestovall, Box 543-BT, Chicago.

JUST Out, a tool with dozens of uses. 9 sales out of every 10 shown. Big profits. Write direct to manufacturers. B. Smith Novelty Company, Danbury, Conn. (Canadian Office) Box 71, Calgary, Alberta.

$5 A DAY and up easily earned taking orders for our Special 7-bar box of assorted toilet soap—sells on sight—wonderful repeater. Ladies and men make big profits. No heavy case to carry. Write for Special Offer. Crofts & Reed Co., Dept. C-359, Chicago, Illinois.

NEW simple wonderful purchase regulator with office System, which every dealer must have. The only one of its kind. Copyrighted. All rights reserved. Pertains also to war income tax. Sells for $3. Profit 100%. Goodwill Service, 1519 Olive Ave., Chicago.

PHOTO Pillow Tops, Portraits, Frames, Sheet Pictures, Medallions, Patriotic Pictures, Pennants. Rejects credited. Prompt shipments; samples and catalogues free to agents; 30 days' credit. Jas. C. Bailey Co., Desk T-6, Chicago.

AGENTS! Large "Over-There" Star Service Flag. Sells 75c, cost $4.50 doz. Sample 40c. Mills & Mills, 802 Fisher Bldg., Chicago.

AGENTS: Great Big Clothes Brush, sells 40c—cost $2.50 dozen. Sample 25c. Mills & Mills, Fisher Bldg., Chicago.

OWN an Automobile Supply Business. Tremendous sales to motorists and garages. Carbon Remover, Puncture Cure, Tire Patches, etc. Liberal profits. Small capital required. Car owners preferred. National Products Company, Dept. P, Owego, N. Y.

AGENTS make 500% profit handling Auto Monograms, Patriotic Pictures, Window Letters, Transfer Flags and Changeable Signs. Catalog Free. Hinton Co., 6142 40th Court, Chicago, Ill.

COUNTY Rights for "Sal-O-Lac." Something new. Big profits. Everybody needs it. Cameron & Calisen, 154 W. Randolph St., Chicago.

PRESTO, slip up your sleeves over elbows without unbuttoning. Cuffs open and close automatically when raised or lowered. Great convenience. Abnormal profits. Sells everywhere. No competition for competent agents who sell direct to wearer. Enclose stamps. Flexo, PM, Sheboygan, Wisconsin.

WONDERFUL Adding Machine—Seven-column capacity—retails for one dollar. Sells itself everywhere. Most offices purchase several. Sensational agency proposition. L. J. Leishman Co., Dept. E, Ogden, Utah.

GET Davis' 1918 Prosperity Offer—Best in 21 years—Our Food, Soap and Toilet Goods cut store prices, ½ to ½. Everybody buys to lower living cost. E. M. Davis, Dept. 506, 910 Lake St., Chicago.

AGENTS, big money selling latest household invention. Sample 25c. Particulars free. Webster & Co., 2935 N. Clark St., Chicago, Ill.

AGENTS, "Eggite," the guaranteed substitute for Fresh eggs, means Eggs at 8 cents per doz. Enormous demand everywhere; big profits; Sample Free. Dougherty Mfg. Co., 335 East 22nd St., New York.

AGENTS seeking first-class auto accessory, see Hydronizer, under Auto Supplies.

WORLD'S Fastest Selling Auto Accessory. County distributors wanted; good profits; write today. G. L. W. Spring Oiler Co., San Diego, California.

AGENTS: New automatic chair seat. Fits any broken chair. No nails, tacks or glue. Big seller. Clear $10 a day. Free demonstrating samples. Automatic Seat Co., 3662 North St., Dayton, Ohio.

MAKE $25 to $75 weekly taking orders for Guaranteed Made to Measure raincoats for men, women, children. Every coat guaranteed. Cash commissions; we deliver and collect. Big Line. Write for free samples. Rainproof Coat Co., 309 Julian St., Parkersburg, West Va.

GOOD income spare time, refinishing chandeliers, brass beds, automobiles, etc., by new method; producing amazing results; every household possible customer; experience unnecessary; simple plan of manufacturing at home starts you in a big money-making business; write for free samples showing finishes, etc. Gunmetal Co., Ave. H., Decatur, Ill.

$500 PER month selling Stransky's new patented fuel vaporizer for Fords; saves up to 50% of gasoline. No drilling necessary. Sold on money back guarantee. Stransky Vaporizer Co., Pukwana, S. Dak.

AGENTS are coining money with Cramer fibre broom. Outlasts four corn brooms. Retail $1. Cramer Mfg. Co., Wichita, Kans.

AGENTS—Sell our 25c Coupons and get rich; something new; liberal supply and particulars free. Pauley Office, Erie Bank, Buffalo.

TERRITORY Given Away. "New all rubber Stictite" for inner tubes. "Mengo," 3603 Fifth, Pittsburg, Pa.

AGENTS—Handle our line of Salesboards; including Jitney Store Salesboard, strictly legal. Latest Premium Specialties. Gordon Specialty Agency, Dept. B, 52 West Chippewa, Buffalo, N. Y.

AGENTS, get particulars of our line of fast selling summer specialties. W. Gilmore, 335 East 22nd St., New York.

FREE circulars outline honest money-making business started anywhere without capital; big profits. B. Critchley, Wollaston, Mass.

WANTED: Butterflies, insects. Some $1-$7. Prospectus Free. James Sinclair, Los Angeles, Cal.

STOP. $100 weekly easy. See "Morlight" Advertisement under "Ford" Owners Column.

"ATROCITIES of War," 64-page book depicting Boche brutality. Postpaid 25c. Agents wanted. John Kunzog, Warren, Pa.

PROFIT by reading "Mail Order Money." 25c postpaid. Colonial Company, Woodhaven, N. Y.

MAKE and sell your own goods. Opportunity unlimited. Machinery unnecessary. Twenty biggest sellers. Information free. Technical Laboratories, 500 Fifth Avenue, New York.

QUICK Snap Various Propositions to agents. Dept. 8, Sunnyside Co., 614 Sunnyside St., Danville, Va.

SELL Keyless Padlocks. Big profits. Fully guaranteed. Particulars free. Chaney Service Co., Dept. 4, Canton, Ohio.

AGENTS—Specialty Men sell the Simplex Auto Brush, new auto and wagon washer; fits any hose; sure, quick cash sales; free samples. Francis L. Mfg. Co., Harrisburg, Pa.

PERFECTOR for Ford Motor Oiling System. New invention. Saves ¼ to ½ the oil. Less carbon. Less spark plug trouble. Motor runs smoother. Installed in a few minutes without raising the hood. No changes in motor or any adjustments. Fifty cents, postpaid. Good inducements to agents, dealers and garages. Perfector Mfg., Los Angeles, Cal.

AGENTS—Get in line for Summer trade, something everybody will buy, send for circular, ten cents inclosed will bring convincing sample. E. F. Gilbert, 122 Pleasant Ave., Lancaster, N. Y.

STOP Hero—Sell the Eisen Regulator for Ford Headlights. Going like wildfire everywhere. Gives splendid driving light at low speed; keeps bulbs from burning out; operates automatically. Wanted for every Ford. Big profits quick. Listen: Siler, Okla., sells 12 daily; profit, $20. McFarland, Nebr., made $3,420 in 17 weeks. No experience necessary, we show you how. Not sold in stores. Sales guaranteed. No capital necessary. Write today for special offer. Address Eisen Instrument Co., 699 Valentine Bldg., Toledo, Ohio.

AGENTS Coining Money selling Nature's Best and Most Natural Laxative; control the sale of Edring's Herb Tablets for Constipation in your territory. J. E. T. Pharmacal Company, Allentown, Pa.

NEW $2.50 Automatic Adder. Money maker for live agents. Quick sales; big profits; no competition. Bassett, 5921-L, Indiana Avenue, Chicago.

AGENTS—Send for sample "Fretnot"—the wash day wonder. Be convinced you can do a whirlwind business. You can clear at least $20 to $100 weekly, according to spare or whole time. You don't have to talk; if she doesn't buy at sight, leave sample; she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory guaranteed to agents who can produce. Credit given. Don't call. P. M. Motter & Sons, 3213 Warren Ave., Chicago.

AGENTS—Men and women wanted. New Monitor Self-Heating Iron; $30 to $50 a week actually being made now by men and women. The original—the best—the lowest priced. Nickel-plated—looks good—makes good—sells fast—guaranteed. No experience needed. Exclusive territory. Work all or spare time. Mrs. Nixon, Vt., sold 8 first half day. Evans, N. C., sold 2 doz. one Saturday. Liberal terms. Prompt selvice. Send for free outfit offer. Write today. Monitor Sad Iron Company, 908 Wayne St., Big Prairie, Ohio.

AGENTS make 500 per cent profit selling our Auto Monograms and Initials, Window Sign Letters, Changeable Signs, and Show Cards. 1,000 Varieties. Enormous Demand. Sullivan Co., 1123 Van Buren St., Chicago, Ill.

SALESMEN—City or Traveling. Experience unnecessary. Send for list of openings and full particulars. Prepare in spare time to earn the big salaries—$2,500 to $10,000 a year. Employment service rendered members. Address nearest office. Dept. 134-C, Natl. Salesmen's Tr. Ass'n, Chicago, San Francisco, New York.

AGENTS—New Invention Puzzles Auto World; wonderful chemical cloth; one rub over rain, snow blurred windshield, presto! glass stays clear 24 hours; can't blur; Putnam cleared $120 first week. Investigate. Security Mfg. Co., Dept. 10, Toledo, Ohio.

INCREASES mileage. Saves gasoline and eliminates carbon trouble entirely; soluble, no sediment, no filtering, intensifier and vigorizer, 100 tablets, price, $1.00. Dept. A-705 Oakwood Blvd., Chicago, Ill.

TAILORING Agents: Take no chances with uncertainties. Line up now for Fall with an organization that will make good. Largest woolen stocks, proper and efficient help—insure your profits. The Fall Commercial line will be the strongest popular priced tailoring proposition in the country. Write today for particulars. Commercial Tailors, 500 S. Wells St., Chicago.

TAILORING Agents Wanted—Big complete sample outfit and case, nearly 300 large cloth samples, 3-piece lists and everything needed for canvassing, or use in store, free to live agents. $25.00 to $50.00 a week; may make more. Write us today for free elegant outfit to begin, cloth samples, wholesale prices, special offer on a suit for yourself and full information—see our wonderful values, beautiful fabrics and styles. Established 28 years. Every garment made to measure—everything guaranteed and express prepaid. Just send a postal. American Woolen Mills Co., Dept. 614, Chicago.

I WANT 100 men and women to act as my agents and take orders for Kantleak raincoats. I paid Eli Bridge $88.95 for orders taken during his spare time in one week. Cooper made $314 last month. Wonderful values. A dandy coat for $3.98. Four average orders a day gives you $2,500 a year profit and an automobile free at the end of six months. No delivering or collecting. I'll give you a sample coat and complete outfit for getting orders. Hurry. Write for my liberal offer. Comer Mfg. Co., Dept. U-16, Dayton, Ohio.

$10 A DAY Profit—manufacture Barley Crisp; new confection; 5c package costs you 1c; machine, instructions complete, $7.50 prepaid; send 10c for samples. Barley Crisp Company, 1267 Broadway, San Francisco.

LETTER owner's initials on autos for $1.50; pays 800% profit. Outfit costs you $2.50; no skill or experience required; great sales opportunities; write for particulars. American Monogram Co., Dept. "R" 196 Market St., Newark, N. J.

AGENTS: $30 to $100 a week. Free samples. Gold sign letters for Stores and Office Windows. Anyone can do it. Liberal offer to general agents. Metallic Letter Co., 467 N. Clark St., Chicago.

AGENTS—100% profit—sell to saloons; machine whirlwind seller. Free sample and salesmanship course. Two sales a day, $15 profit. Mohler, Box 453, Chicago.

INVENT Something. Your Ideas May Bring Wealth. Send postal today for Free book. Tells what to invent and how to obtain a patent through our credit system. Talbert & Talbert, 4663 Talbert Bldg., Washington, D. C.

RELIABLE people wanted—place our delicious Orangeade in stores and appoint agents. In powder, just add cold water; 10 big glasses 10c postpaid with particulars. Morrissey Company, 4411, 21 Madison, Chicago.

WONDERFUL New Chemical. $1.00 package equals 50 gallons gasoline. Eliminates carbon. 30% more mileage, power, speed. Guaranteed. Whirlwind seller. Auto owners buy on sight. 100% profit. Repeater. Demonstrating Package; Terms, Territory. 10c postage. Myers & Co., 28 Baird, Cambridge, Ohio.

OVER 500% profit applying transfer monograms on automobiles, trunks, etc. Easily applied. Directions and samples free. Kinney-Wagner Co., 299 Broadway, New York.

300% PROFIT—Agents Clearing Hundreds Weekly. New Washing Compound. Wonderful seller. Big repeater; Nature's mightiest Cleanser. Send for proof; free sample. J. Mitchell, 1314 E. 61st Street, Chicago.

AGENTS going wild over our great new book, "War for Human Rights." Complete outfit 25c stamps. Credit given. Will pay you $225 for 90 days' work. Mead Publishing Co., Johnson, N. Y.

NEW—Guaranteed, Easy to Sell. Big profit. Tyre-Tyte Seals Punctures. Preserves Rubber. Stephens-Gates Co., Seattle, Wash.

TO take orders for high grade household goods. We do all delivering and send you check every Saturday. Cascade Merchandise Corporation, 857 L. C. Smith Bldg., Seattle, Washington.

KEROSENE Gas Burners in Cook Stoves or Ranges stop use of wood or coal. Recently patented. Money-maker for Agents. The Vapor Gas Burner Co., Desk 8, Columbus, Ohio.

PORTRAIT Men: Agents or crew managers write today for our new proposition. Frames and convexed glass at factory prices. Guaranteed portraits; prompt shipments. Williams Portrait & Frame Co., 2609 Taylor St., Chicago.

NEW Invention: One raindrop closes window. Price $2.00. Sample postpaid, $1.00. See Magazine March, page 408. Circular Automatic Window, 2107 N. Percy St., Philadelphia.

SELLS like hot cakes. Big profits. New ironing wax. Perfumes clothes. Working outfit 5c. New offer. Perfume Gloss, 11 Water St., N. Y.

WONDER Pudding Powder makes the most delicious Chocolate, Raspberry, or Lemon pudding you ever tasted. 5 to 7 large dishes in a jiffy for 10c. Sell it to stores, restaurants, hotels, families. Appoint agents. Big profits, wonderful seller. Package and particulars 10c postpaid. Morrissey Company, 4414 Madison, Chicago, Ill.

AGENTS: 200% profit. Wonderful little article. Sells like wildfire. Can be carried in pocket. Write at once for free sample. H. Mathews, 462 North St., Dayton, Ohio.

AGENTS: New high-class phonograph. Easy to carry. Built right into a carrying case. Wonderful tone—low price. Easy seller. Plays all records. Write for demonstrating sample. Ochestrola Co., 1162 North St., Dayton, Ohio.

AGENTS—To Travel by Automobile introducing our Big Line of fast summer sellers. The greatest line on earth. Make $10 a day easy. Complete outfit and automobile furnished to workers. Write at once for exclusive territory. American Products Co., 3839 3rd St., Cincinnati, Ohio.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejects credited. Prompt shipments. Send for latest catalogue and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

HEL-MIT the Kaiser Pin—Latest war novelty—Biggest Hit Out; oxidized silver; thousands being sold; simple matter handing them out and taking money; sample with agents' terms 10c. O. Finch Company, Grand Rapids, Michigan.

SIGN Agents to represent us in your locality. Unlimited field, samples and particulars free. Interstate Sign Co., 2424 N. Halsted St., Chicago.

DON'T miss this winner, 300% profit. Hingston, Turner St., Utica, N. Y.

AGENTS—We have the Best Side Line or Leader on the American Market today. Will fit any business. Attractive proposition free. Macine Company, Lowell, Mass.

$15.00 MADE first day by 13-year-old boy with Shomescope. Woman made $6.00 first hour. Particulars Free. Shomescope Mfg. Co., 4923 Montgall, Kansas City, Mo.

MEN and Women—Do you know you can make from $5.00 to $10.00 profit each day selling Sanitary Brushes for all purposes? No experience needed. All or part time. Puritan Co., Dept. M, 1966 Broadway, New York.

AGENTS: Gaso-Tonic, the successful gasoline exhilarator, absolutely harmless, more miles per gallon, less carbon, easier starting, quicker acceleration, makes low-grade gasoline act like high-proof. Additional cost, one cent per gallon. Attractive agent's proposition. Gaso Tonic Company, Cincinnati, Ohio.

AGENTS: Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Auto monogram letters. Particulars Free. Stalbrite Co., 1115 Second Ave., New York.

"RADIO" Luminous Paint outshines the imported—reasonable price. Only American manufacturers. Write for information. American Luminous Products Co., Huntington Park, California.

AGENTS: $60 weekly and automobile furnished men placing samples; wonderful new automobile necessity with automobile owners. Reduces operating expense. Makes old cars run like new. $30 outfit furnished free. L. Ballwey, 189 Sta. F., Louisville, Ky.

HOSIERY and Underwear Manufacturer offers permanent position supplying regular customers at mill prices. $50.00 to $100.00 monthly. All or spare time. Credit. D. Parker Mills, 2733 No. 12th St., Phila., Pa.

"MACO" Light Intensifier gives 100% more light to Fords. Sells on sight. Big money maker. Money back guarantee. Manufacturers Agency, 424 Wainwright, St. Louis.

INVEST $2.50 for a complete outfit of 100 "A" Old English Transfer Initials, Monogram, automobiles, etc. Your net profit $27.50. Particulars free. Globe Decalcomanie Co., Dept. 2, Jersey City, N. J.

AGENTS—Sell "Schemmel Welding Machines." Agents making $100.00 to $200.00 per week. Schemmel Welding Machine Works, Wapakoneta, O.

BROOM, Panama fibre. Quick sales. Outwears several other kind. Sweeping made easy. Some territory still open for good agents. Sanford Brush Co., 544 W. Lake St., Chicago.

AGENTS Wanted—Toliver Guaranteed Puncture-Proof Inner Tubes sell easily—our Agents make $5.00 to $50.00 a day net profits—no competition. If you wish to establish a business of your own that has unlimited possibilities for profit, write us for complete details. Toliver Tube & Tire Co., 43 Toliver Bldg., Denver, Colo.

HUGE profits selling Nibco Sanitary Brushes, Auto Washers, Brown Beauty Adjustable Floor Mops, Dustless Dusters, and other specialties. Big line. Fast sellers. Write today. Silver-Chamberlin Company, Department M, Clayton, New Jersey.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours, will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 12c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Dograw St., Brooklyn, N. Y.

AGENTS—A New One! Harper's Fibre Broom and Ten-Use Brush Set combined. Saves broom expense; lightens housework; easy seller; first order returnable. Harper Brush Works, Dept. X, Fairfield, Ia.

AGENTS—Men or women—write for the greatest money-making proposition ever made agents; $5 to $10 daily easily made; experience unnecessary; agents' outfit free; enormous demand; sells fast. Yanoco Ivory Co., Ave. P, Leominster, Mass.

AGENTS make $150.00 monthly selling our Handy Household Articles; catalogue free. Scheff Company, Desplaines, Illinois.

GASOLINE Saver for Fords: New Principle; saves 30% gasoline; gives 30% more power. No moving parts; put on with wrench in ten minutes. Price $1.50. Guaranteed. 100% proposition to agents. The Little Cyclone Accessories Co., Dayton, Ohio.

AGENTS sell Reliable Custom-Made Raincoats and Gabardines. Big commission. Complete sample line free. Temple Raincoat Company, Templeton, Mass.

LARGE Manufacturer wants representatives to sell shirts, underwear, hosiery, dresses, waists, skirts, direct to homes. Write for free samples. Madison Mills, 503 Broadway, New York City.

WANTED—New Ideas. Write for list of Patent Buyers and Inventions Wanted. $1,000,000 in prizes offered for inventions. Our Four Books sent free upon request. Victor J. Evans & Co., 163 Ninth, Washington, D. C.

AGENTS: Our new inventions will earn you steady income. Canvassers, County Rights Salesmen and Promoters write Fisher Mfg. Co., 2061G Railway Exchange, St. Louis, Mo.

NINETY Per Cent of Your Calls Turned into Sales! Wonderful Enthusiasm Follows Every Demonstration! Write at Once for Full Particulars of Our Line of Eradium (Luminous) Articles. Startling! Mysterious! Everlasting! Novel! They Shine in the dark. Crucifixes, House Numbers, Bulbs, Match Boxes, Pictures, Switch Plates. Sole Manufacturers. The Pioneer Corporation, 1259 W. 63rd, Chicago.

AGENTS—Sell rich-looking imported 36x68 rugs, $1 each. Carter, Tenn., sold 115 in 4 days. Profit, $57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug by parcel post, prepaid, 98c. E. H. Condon, Importer, Stonington, Maine.

PATENTS That Protect. Write for free books. Highest references. Best results. Watson E. Coleman, Patent Lawyer, Washington, D. C.

INSYDE Tyres, inner armor for Automobile tires double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P, Cincinnati, O.

AGENTS—Make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404B Amsterdam, N. Y.

DON'T Wash your automobile. Dri-Kleanit does the job without water. Wonderful demand. Big profits. Details free. Dri-Kleanit Co., Dept. P., Cincinnati, O.

$50 WEEKLY and up selling Mexican Diamonds. Exactly resemble genuine; Same Rainbow Fire; Stand tests; sell at sight; Repeat orders. Write quick for Sample Case offer free. Mexican Diamond Importing Co., S. W. Las Cruces, New Mexico.

MAKE and Sell Your Own Goods. Machinery unnecessary. Expert Chemists advise. Special attention to beginners. Write for Formula Catalog. Blake Mystic Company, Washington, D. C.

AGENTS, $50 a week. Will show you how. Genuine Gold Leaf Window Letters. Chicago Agency Co., 842 Altgeld St., Chicago.

AGENTS: Big Hit: Our 5-Piece Aluminum Set is all the rage. Cheaper than Enamel Ware. Sells like wildfire. Guaranteed 20 years. Retail value $5.00. You sell to housewives for only $1.98. Biggest seller of the age. 9 sure sales out of every 10 shown. Others cleaning up $10.00 to $20.00 a day. Answer this quick to secure your territory. Div. GG5, American Aluminum Mfg. Co., Lemont, Ill.

AGENTS: Big Profits putting up Genuine Gold Leaf Window Letters; Scripts and 15 other Styles. Chicago Agency Co., 848 Altgeld St., Chicago.

DON'T Scrape or burn carbon out of automobile motors. Dissolve it with Carbogon. Tremendous demand. Big sales. Details free. Carbogon Co., Dept. P., Cincinnati, O.

AGENTS — Ho-Ro-Co Skin Soap and Toilet Goods plan beats everything for agents' profits. "Ho-Ro-Co.," 112 Locust St., St. Louis, Mo.

STREET Car Conductor making $60.00 a week. Others averaging $25.00 to $100.00 selling guaranteed silk hosiery and underwear, direct from factory to wearer. Live agents wanted everywhere. Write today. C. & D. Co., Dept. 12, Grand Rapids, Michigan.

PORTRAIT Agents, new and old, write us. We know what you want and need. Established 17 years. Pioneer, 1252 W. 63rd St., Chicago.

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Additional Classified Ads Page 34

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Continued from Page 32

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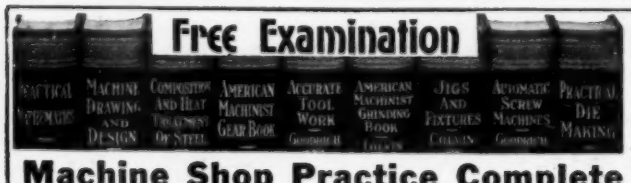

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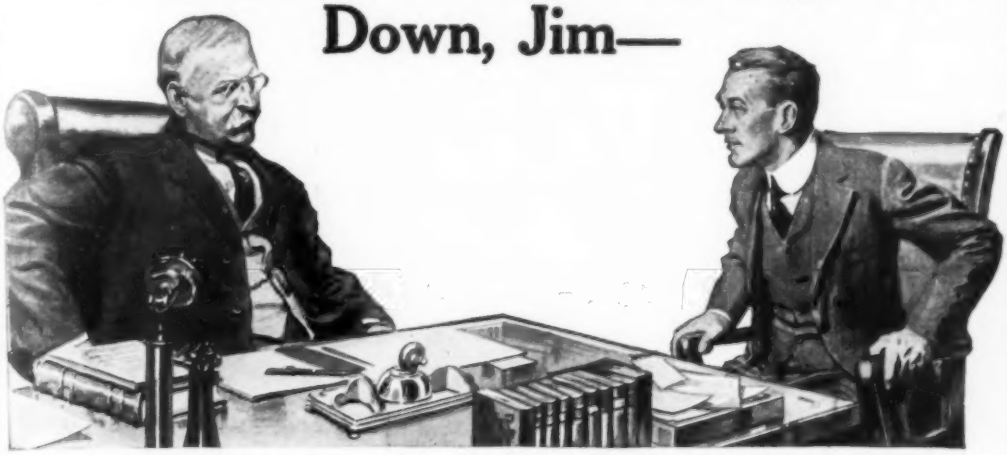

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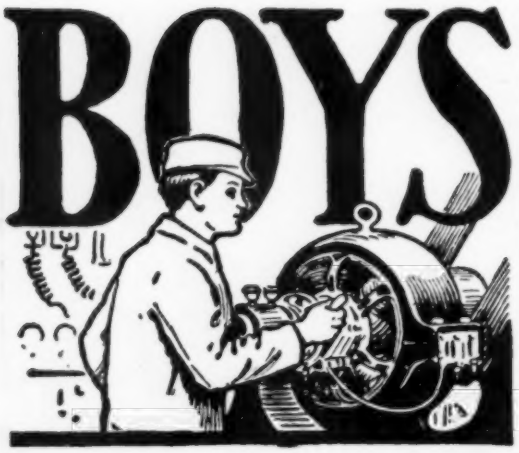

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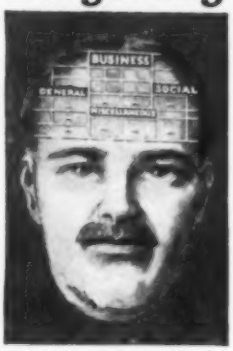

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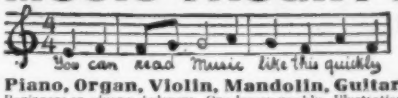

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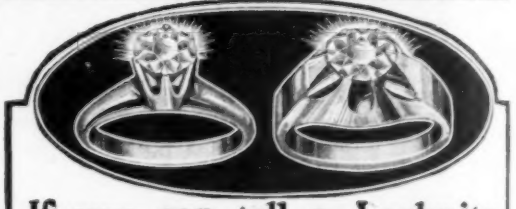

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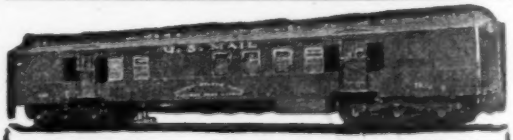

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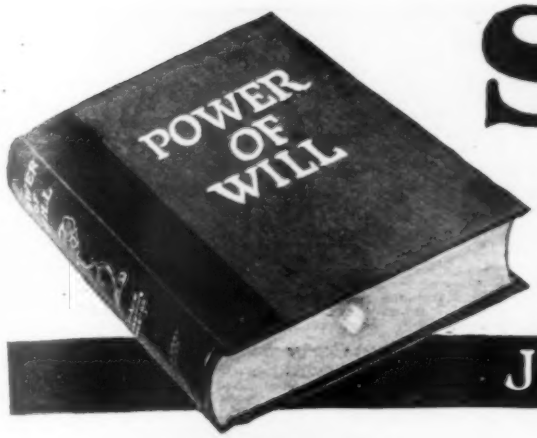

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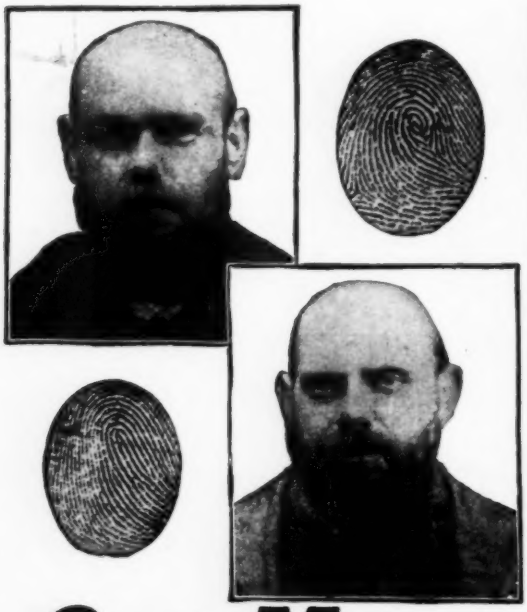

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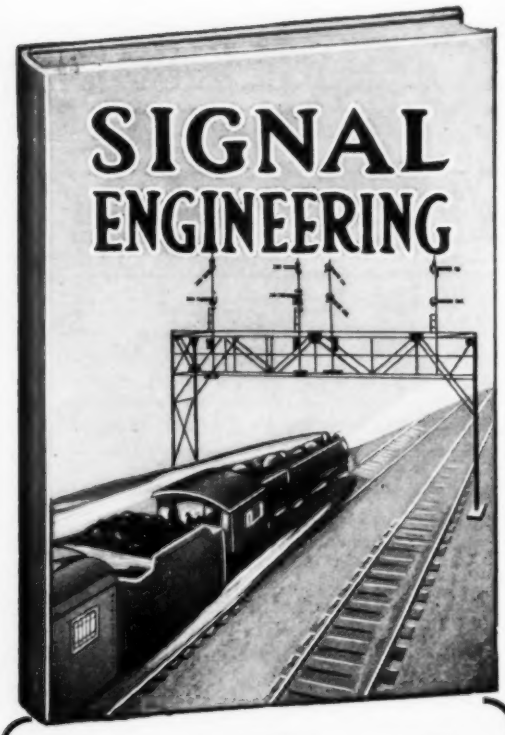

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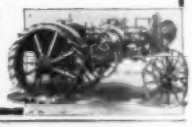

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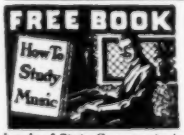

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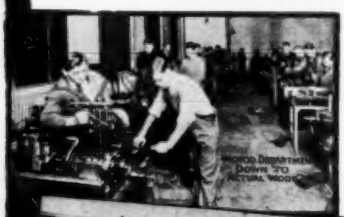

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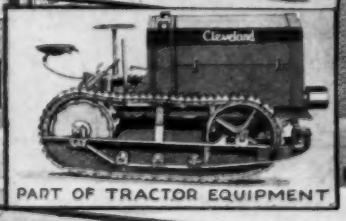

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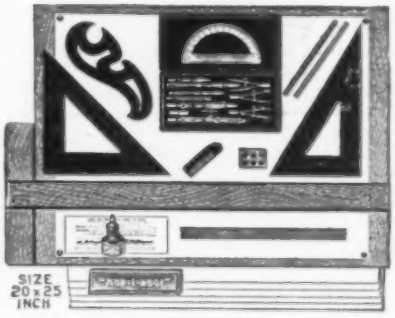

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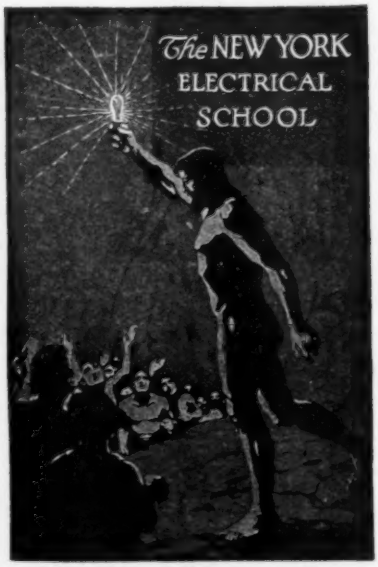

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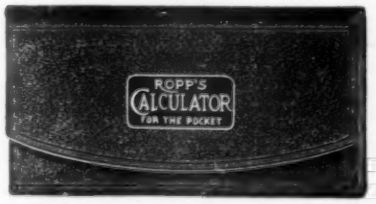

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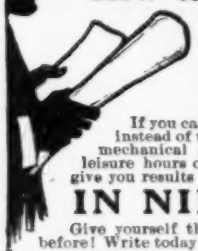

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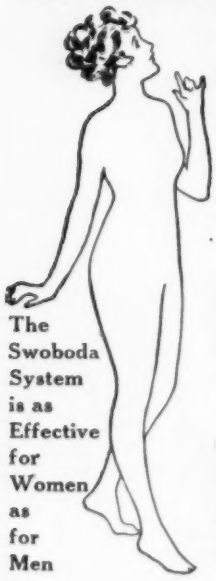

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Conscious Evolution will show you how to intensify, prolong, increase and magnify your pleasures. "CONSCIOUS EVOLUTION" and "THE SCIENCE OF LIFE" will show you that you have not as yet experienced the real and highest pleasures of life, and will show you how to attain the super-pleasures of life. In a word, these two essays will reveal the startling, educating and enlightening secret of gigantic health and mind power. "CONSCIOUS EVOLUTION" and "THE SCIENCE OF LIFE," which Swoboda has written and copyrighted, will be sent you free of charge and free of all obligation to Swoboda, if you will write for them.

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ALOIS P. SWOBODA, 2147 Berkeley Bldg. New York City

The Ultona

Now! The Final Achievement

Brunswick introduces a new Method of Reproduction, a real sensation

HERE, at last, is the supreme phonograph achievement of recent years—The Brunswick Method of Reproduction.

It includes two distinctly new improvements, two inventions that absolutely revolutionize old standards.

Better Than Ever

Now, with this new Brunswick Method of Reproduction, we offer a super-phonograph.

It not only plays *all* records, but plays them at their *best*.

This is accomplished chiefly by The Ultona, our new all-record reproducer, and the new Brunswick Tone Amplifier.

Tone values are now given a naturalness hitherto unattained. Some of the gravest problems in acoustics are solved.

The Ultona is an amazingly simple contrivance. It plays all records according to their exact requirements. The proper diaphragm is presented to each record, whatever make, and the exact needle, the exact weight.

So you see that this is not a make-shift, not an attachment, but a distinctly new creation.

Simplicity Itself

At the turn of a hand you adapt The Ultona to any type of record. A child can do it. It is practically automatic.

The Ultona, we think, is the greatest feature offered any music-lover. And it is obtainable *solely* on the new Brunswick.

Another vast improvement in tone projection comes in our all-wood Tone Amplifier, built like a violin. All metal construction is avoided, thus breaking away from the usual custom. Wood, and *rare* wood at that, is the only material that gives sound waves their proper vibration.

See and Hear

You cannot afford now to make a choice until you've heard the latest Brunswick. Until you become acquainted with The Brunswick Method of Reproduction. Until you hear this marvelous instrument. All you want in any phonograph is found in this composite type. Plus superiorities not found elsewhere.

A Brunswick dealer will be glad to play this super Brunswick for you and explain the new Brunswick Method of Reproduction.

Brunswick Models—Price $32.50 to $1500

The Brunswick-Balke-Collender Company

Canadian Distributors:
Musical Merchandise Sales Co.
Excelsior Life Bldg., Toronto

General Offices: Chicago
Branch Houses in Principal Cities of the United States, Mexico and Canada

Dealers:
Write for our Profitable Plan with all the details
(1186)

ALADDIN

A Book For Homebuilders

Before you build, get a copy of the beautiful book "Aladdin Homes"—the most wonderful book ever issued for homebuilders. It pictures many homes—the most popular types—bungalows of California designs, attractive dwellings of one and two stories, summer cottages, garages, etc., complete with pictures of each, floor plans and descriptions. This book has an important message for every homebuilder. Get your copy today.

Avoid Waste When Building

The waste of lumber in building is 18%. Homebuilders can avoid throwing this 18% away. The book of Aladdin Homes shows how it is reduced to less than 2%—a saving to you of not less than $16.00 on every $100.00 of your building money. Thousands of builders have made substantial savings building Aladdin Houses—you have the same opportunity.

Aladdin Houses Will Save You Money

Aladdin Homes are sold direct to you—no dealers' profits. You buy direct from manufacturer and your complete house is shipped in one car by shortest route. Price includes all lumber cut to fit, millwork, doors, windows, lath and plaster, hardware, locks, nails, paints, varnishes, etc. Send stamps today for copy of the beautiful book "Aladdin Homes" No. 180.

Send stamps today for catalog 180

THE ALADDIN CO.

185 Aladdin Avenue BAY CITY, MICH.

Canadian Branch: Canadian Aladdin Co., Ltd., C. P. R. Bldg., Toronto, Ontario

You Who Cannot Go, do Your "Bayonet Exercise" with a Bristol

Advance and retreat, side step and guard, parry and thrust, lunge and butt strike—fishing makes every muscle in your body tingle and quiver in the same way. If we must take months and months of precious time to build up the soldier's body, is it not important and a patriotic duty for everyone of us who cannot go to take the time and make the patriotic effort to put ourselves in the most perfect physical and mental fitness for carrying the extra burdens which the war puts upon us? Don't break down and become a liability. Fish mornings, nights, holidays, and week-ends and make this a fishing vacation. Eat fish and save meat and wheat. Catch all the fish you can.

"Bristol" Steel Fishing Rods

have just the right shape, hang, resiliency, snap, durability and beauty of workmanship and finish to make them not only the most popular but the most practical and successful fishing rods to be had anywhere at any price. There is a special "Bristol" to suit your purse, your locality and your kind of fishing. $3.50, up. Buy a "Bristol" for your boy so that he can supply the family with fish, thereby saving meat and wheat for the fighters at the front.

"Bristol" Meek Catalog FREE

MEEK and "Blue Grass" REELS

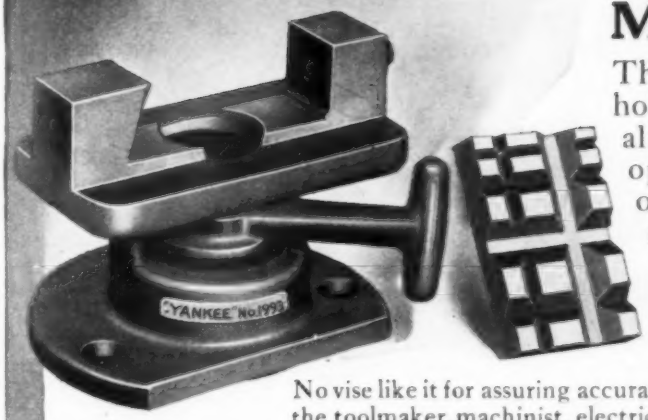
are tools of such superb materials, designing and workmanship that the most expert and most experienced successful fishermen use them with that absolute confidence that comes only through association in many hard won victories. Your dealer—if he knows—can tell you all about these rods and reels. If he is not keen to serve you, you can order them by mail direct from the makers at catalog prices plus the regular 3% war tax.

THE HORTON MFG. CO.
196 Horton Street BRISTOL, CONN.

Pacific Coast Branch: PHIL. B. BEKEART CO. 717 Market Street, San Francisco, Cal.

Removable *from* its Base *for* Continuous Work

Multiplies Man's Power



This "YANKEE" Vise holds work in original alignment for numerous operations—at the bench, on drill press, milling machine, planer, etc. Machined square. Sets level on end, bottom or either side. V-grooved steel block holds round or irregular shapes.

No vise like it for assuring accuracy and saving time and labor for the toolmaker, machinist, electrician or metal worker in any line.

"YANKEE" Vise No. 1993, with Swivel Base. Price, $6.50

Set screw holds Vise to base; camthrow lever locks position. Body 7¼ x 2¾ (wide) x 3 in. Hardened steel faced jaws, open 3⅛ in.

"YANKEE" Vise No. 993—Same as No. 1993, but without swivel base. **Price, $4.50**

Your dealer can supply you

Ask us to send you free "'YANKEE' Tool Book" showing complete line of ingenious "YANKEE" Tools for modern efficiency work—bench, chain, breast and hand drills, wood-boring and screw-driving tools.

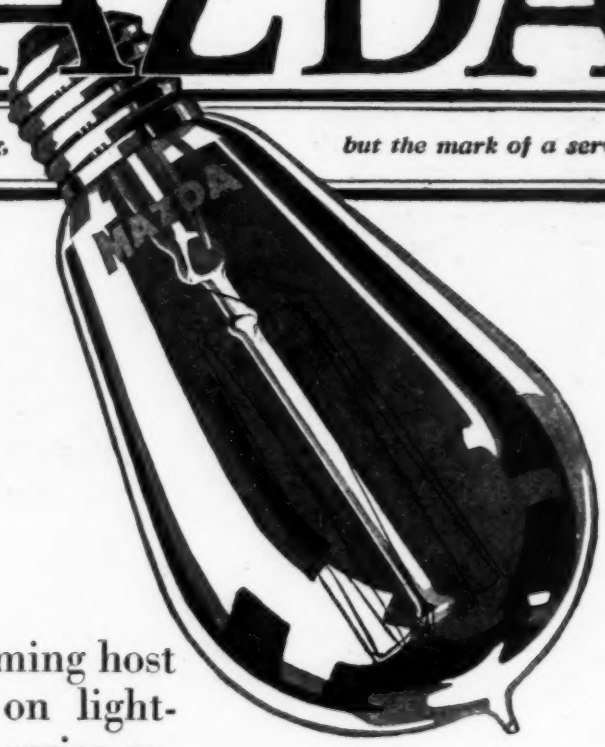
NORTH BROS. MANUFACTURING CO., Philadelphia

"YANKEE" TOOLS

Make Better Mechanics

MAZDA

"Not the name of a thing, but the mark of a service"



From the incoming host of new ideas on lighting, MAZDA Service selects for the makers of MAZDA Lamps, only those developments in design, materials and methods that will improve the light you enjoy

The Meaning of MAZDA

MAZDA is the trademark of a world-wide service to certain lamp manufacturers. Its purpose is to collect and select scientific and practical information concerning progress and developments in the art of incandescent lamp manufacturing and to distribute this information to the companies entitled to receive this Service.

MAZDA Service is centered in the Research Laboratories of the General Electric Company at Schenectady, New York. The mark MAZDA can appear only on lamps which meet the standards of MAZDA Service. It is thus an assurance of quality. This trademark is the property of the General Electric Company.

RESEARCH LABORATORIES OF GENERAL ELECTRIC COMPANY

4641

Please Mention Popular Mechanics

A FAR CRY from the quill pen to Corona, and from the slowly traced letters of long ago to the crisp, legible type of today's "personal writing machine."

A necessary development, though, to keep pace with today's greater demands. For Corona can handle all your business or personal writing, neatly, legibly, speedily—can put it into permanent, business-like form, with carbon copies for your file. It folds compactly into a desk drawer, or into its handy case for travel; like other personal possessions, you can take it with you anywhere.

Corona weighs but six pounds, is strongly built, and is exceptionally simple to operate. Adopted by a hundred and fifty thousand men and women. Fifty dollars, complete with case. Descriptive booklet No. 13 is yours for the asking.

CORONA TYPEWRITER CO., INC., GROTON, N. Y.
NEW YORK CHICAGO SAN FRANCISCO
Agencies in All Principal Cities

CORONA

"The Personal Writing Machine"

-fold it up-take it with you-typewrite anywhere

The Graflex

A reflecting camera that lets your eye see what the lens sees, ***before*** exposure, and right side up. You watch the ground-glass screen, adjust focus till the image of your picture grows clear and sharp—then snap it.

See the picture <u>before</u> you snap it

SIMPLICITY, speed, absolute control of focus and composition—the satisfaction that follows increased certainty—this is the Graflex story. Automatic exposures from a tenth to a thousandth of a second; successful *snapshots* in failing light, where slow exposures with other cameras would result in failure; fully-timed negatives, in good light, of two-mile-a-minute motion that other cameras could *never* get. Ask for interesting booklet "Why I Use a Graflex"—free from your dealer or from us.

FOLMER & SCHWING DEPARTMENT
Eastman Kodak Company
Rochester New York

GRAFLEX Camera

Clement Bournique earns famous Winchester trophy

Read all about how you, too, can earn the Sharpshooter Medal

CLEMENT BOURNIQUE, age 10, of Milwaukee, was the youngest contestant to earn the famous Winchester Sharpshooter Medal in 1917.

Any boy or girl not over 18 is eligible to join the Winchester Junior Rifle Corps, wear an official membership button and compete for the famous Marksman and Sharpshooter Medals.

The Winchester Junior Rifle Corps is an honorary organization to encourage marksmanship among boys and girls of America.

Clement Bournique, age 10, of Milwaukee, with his .22 caliber Winchester

Winchester Sharpshooter Medal

How to join

There is a Winchester Junior Rifle Corps headquarters in your town. Register your name for a Membership Certificate which entitles you to a Membership Button and to compete for the famous Winchester Marksman and Sharpshooter Medals.

After you have selected the style of .22 caliber rifle that suits your taste and pocketbook — your dealer has all prices of rifles — ask for a supply of Official Winchester Junior Rifle Corps targets, or sample for pattern from which to make your own. If your dealer has none in stock, write to us direct.

Select a place where you can shoot in absolute safety, tack up your target and pace off fifty feet. Then in the presence of a parent or friend as witness, shoot five shots into the target.

Take it down and put up another. Shoot five shots into the second. Shoot as many targets as you like, always being sure to shoot no more than five shots into each target. If you should miss the target entirely, each miss counts one shot just the same. Shots which strike at the edge of any circle count as being in the highest scoring circle.

When you have made 10 targets, each scoring 19 out of the possible 25 points, sign with your full name, have your friend, who witnessed, also sign each target; then take them to your dealer who will forward them to the Winchester Junior Rifle Corps National Headquarters.

A Winchester *Marksman Medal* will be sent to your dealer who will deliver the medal to you himself. You will also receive from national headquarters a diploma signed by the President of the Winchester Junior Rifle Corps. You are now ready to try for the Sharpshooter Medal. You are required to make 15 targets, each scoring 24 out of a possible 25. Get these targets signed as before and you will receive your Winchester Sharpshooter Medal and Diploma.

The rifle to use

Remember that your rifle and ammunition must be *.22 Caliber* Winchester. Remember, too, that it doesn't make any difference in your shooting whether you get a low priced single shot rifle, or a fine *repeater*. The accuracy of a Winchester is in the barrel and the same quality of steel and the same care in boring goes into all. No Winchester barrel varies more than one one-thousandth of an inch from a straight line.

Get started today. Go to the Winchester Junior Rifle Corps Headquarters in your town and register as a member. If you cannot get all the particulars there, write direct to **Winchester Junior Rifle Corps, National Headquarters, 275 Winchester Ave., New Haven, Conn. Division 1421.**

MODEL 06. Take down Repeating .22 caliber rifle, 20-inch round barrel. Shoots three sizes of ammunition. The most popular .22 caliber repeater ever placed on the market

Take down .22 caliber single shot rifle. A low priced, light weight gun made in two sizes

WINCHESTER

World Standard Guns and Ammunition

Gillette Safety Razor

Have You Seen the New Gillettes Specially Designed for the Fighting Man?

THESE models were designed by members of the Gillette Organization who have seen service with the Colors and know what the soldier is up against.

Hundreds of officers and men are buying them—the U. S. Service Set in metal case, and the new Khaki-covered sets for Uncle Sam's soldiers and officers.

The Gillette is the one razor for the man who is doing things—the one razor with world-wide use and reputation.

When a man wants new Blades he can get them at any Post Exchange or Y. M. C. A. Hut—here in America or Overseas.

Our Paris Office carries stocks—is constantly supplying the American Expeditionary Forces. Gillette Safety Razors and Blades on sale everywhere in France, England, Italy and the Eastern battle fronts.

Why the Gillette Is Especially the Soldier's Razor

THERE isn't a harder shaving job on earth than the service demanded of the Gillette by the fighting man.

Under the very worst possible conditions of climate—with cold or hard water—on sun burned or wind-chapped faces—the Gillette is called upon for its solid-comfort, velvet-smooth shave. **And delivers it.**

There are more Gillettes used than all other kinds of razors added to-gether—the compact, complete razor with no strops or hones to clutter up the kit.

Hundreds of thousands of officers and men have adopted the Gillette—with its blades always sharp, always ready. No Stropping, No Honing.

GILLETTE SAFETY RAZOR COMPANY
BOSTON, MASS., U. S. A.

Gillette Safety Razor Company, of Canada, Ltd.
73 St. Alexander St., Montreal

Gillette Safety Razor Societe Anonyme
17 Bis, Rue La Boetie, Paris, France

Gillette Safety Razor, Limited
200 Great Portland St., London, W., England

A. G. Micheles
53 Liteiny, Petrograd, Russia

Vedova Tosi Quirino & Figli, Via Senato, 18, Milan, Italy

MAIL HERE
WATERMAN'S IDEAL FOUNTAIN PEN
CLIP-CAP
Keep the Home Letters Going
to and coming from
our boys "Over There"
Waterman's
Ideal
Fountain Pen
In Self-Filling, Safety and Regular Types
Sold at the Best Stores
$2.50, $4.00, $5.00 and up
Avoid Substitutes
Folder on Request
L. E. Waterman Co., 191 Broadway, New York
24 School St., Boston; 115 So. Clark St., Chicago; 17 Stockton St., San Francisco
179 St. James St., Montreal; 41 Kingsway, London; 5 Rue Monsigny, Paris

KEEN KUTTER CHISELS

—not part tool steel, but ALL tool steel

THE old method of making chisels was to weld a thin piece of tool steel on a body of soft steel.

But in KEEN KUTTER chisels the *entire blade* is made of highest grade tool steel.

Look at the socket shown here

and note the heavy special reinforcement that prevents splitting even under abnormally heavy blows—an exclusive feature of KEEN KUTTER Chisels.

Just another example of the high quality of material, carefully studied designing and skilled workmanship that enters into the making of *all* KEEN KUTTER Tools.

SIMMONS HARDWARE CO.

"The recollection of QUALITY remains long after the PRICE is forgotten."
—E. C. Simmons.

Trade Mark Registered

Please Mention Popular Mechanics

That lad of yours, over seas.

All that is humanly possible is being done to see to it that he is well fed, well clothed and efficiently equipped. Organizations like the Y. M. C. A., are looking to his physical comfort, healthful recreation and clean fun. If he is sick or wounded the Red Cross will provide for him with tender, loving care.

Yet there is one thing that will bring a smile to his face and a joy to his heart that none of these can give; that only you can give—
your photograph.

There's a photographer in your town.

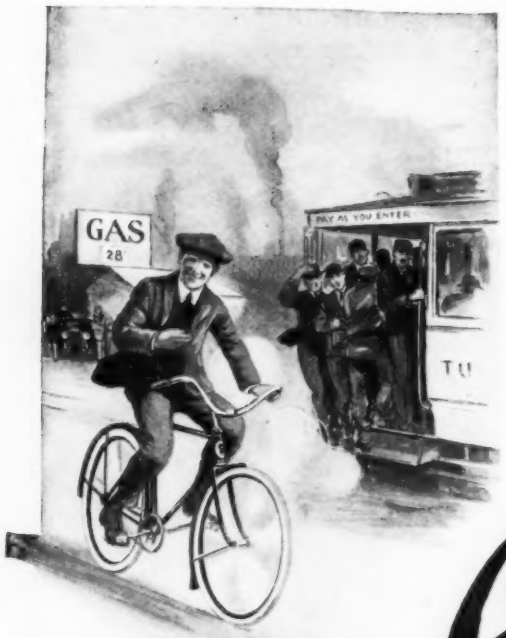
Eastman Kodak Co., Rochester, N. Y

SAVE—and Enjoy It

AS a rule you give up pleasure in some form when you start to save money.

But there is a way to beat the game. You can add greatly to your enjoyment and still save both time and money—by riding a Columbia bicycle.

You can leave home later in the morning, get to work on time, roll home for lunch, return on the dot and then have a refreshing trip homeward again in the evening—if you cover the ground with a quality-built easy riding



Columbia

A Columbia spin after supper is a real tonic, and there are numberless Columbia outings possible for Saturday afternoons, Sundays and holidays.

The Columbia makes every trip a pleasure trip. Its smooth action and sturdy construction are guaranteed—have been for forty years.

Get in line with the national thrift campaign. Save money. Save time. Accomplish more. And do it all pleasantly. The Columbia makes that possible.

Write for Handsome New Catalog which tells WHY the Columbia is best.

WESTFIELD MANUFACTURING COMPANY
DEPARTMENT 15 WESTFIELD, MASSACHUSETTS

Columbia Batteries

Dry Batteries

The good old boat will keep on traveling along if you've got a few husky Columbia Dry Batteries tucked away.

It's quite the stunt to carry a few extra cells—to wire in on a pinch.

Columbia Dry Batteries run autos, engines, motorboats, tractors, trucks, and toys; they furnish light for lanterns and talk for telephones.

You can buy Columbias anywhere; and they are easily and quickly wired up.

Columbias cost no more—and last longer. Fahnestock Spring Binding Posts cost you nothing extra.

Storage Batteries

For 25 years Columbia has meant "the best in batteries."

And for the storage battery needs of every car, Columbia means 100% service. That it will give this service on your car is assured by the honest guarantee that backs every Columbia Storage Battery.

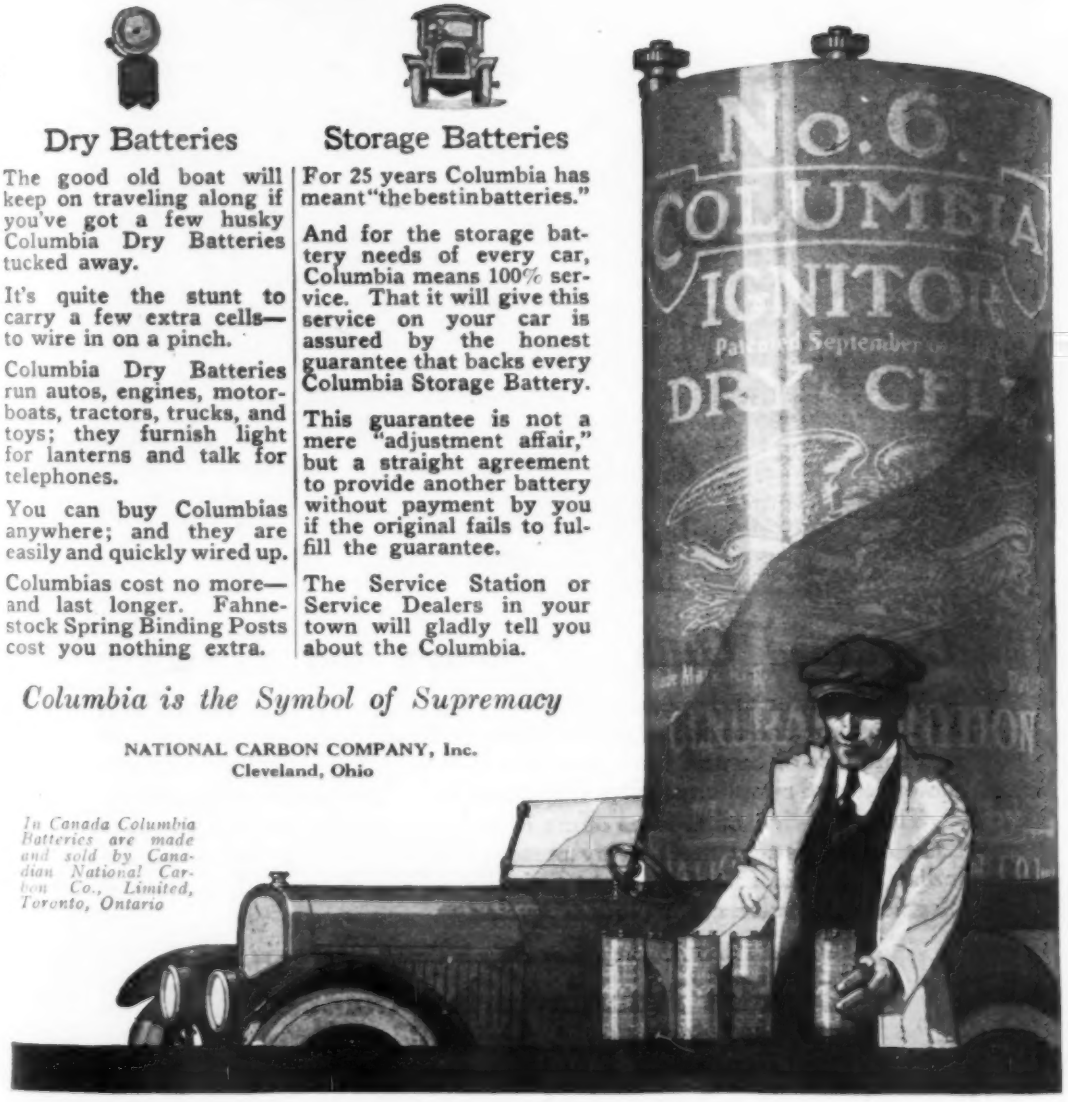
This guarantee is not a mere "adjustment affair," but a straight agreement to provide another battery without payment by you if the original fails to fulfill the guarantee.

The Service Station or Service Dealers in your town will gladly tell you about the Columbia.

Columbia is the Symbol of Supremacy

NATIONAL CARBON COMPANY, Inc.
Cleveland, Ohio

In Canada Columbia Batteries are made and sold by Canadian National Carbon Co., Limited, Toronto, Ontario



Indian Motocycle

with Powerplus Motor
Lowest in Cost, Operation and Upkeep

Combined Utility, Pleasure and Economy

MORE power and speed than you'll ever need. The greatest riding comfort due to the patented exclusive *Cradle Spring Frame.* An ease and sureness of control that lends zest to the driving. Mechanical completeness and simplicity that promotes relish for long, health-giving tours.

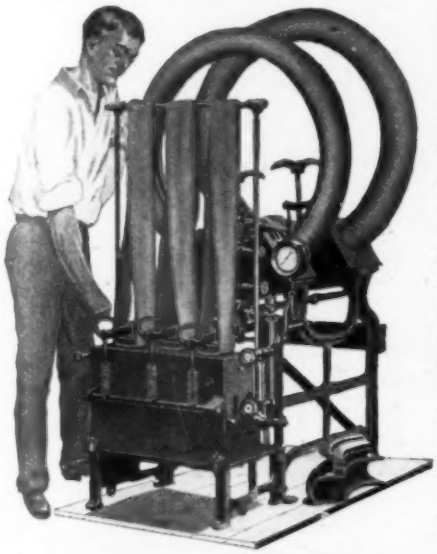
The 1918 line of Indians offers a type and model mount for everybody at prices that meet every present-day demand. It embraces the Indian Big Twin, Side Car, Light Twin, Parcel Car, Electrically Equipped Bicycle, and twelve other model Bicycles.

Illustrated 1918 Motorcycle or Bicycle Catalog sent on request

Hendee Manufacturing Company
697 State Street, Springfield, Mass.
Largest Motorcycle Manufacturers in the World

Do Tire Repairing

With the Equipment Used by All Leading Tire Companies



There is an Akron-Williams outfit for every size shop. No equipment is too large for us to build—no tools are too small.

AKRON-WILLIAMS A-W "PRODUCTS"

RIGHT NOW big money is being made in tire repairing, and scarcely anything else offers such wonderful opportunities for the future. The high price of tires has ***doubled*** tire repairing, and there is a shortage of men to do the work. The business is growing everywhere by leaps and bounds; the work is easy; not much capital is required to start; very little space is needed; lots of business can easily be had at a good profit — all provided you have the ***right*** training and the ***most approved*** equipment. WE FURNISH BOTH.

Over 100 Tire Companies

use Akron-Williams outfits in their own factories, and recommend and sell them to their Dealers all over the World. ***Think what that means!*** Could any endorsement be stronger?

We offer you the same Akron-Williams outfits — invented, designed and perfected with the help of the most expert engineers in the tire industry. With this equipment you do the most efficient work, by the latest and most approved methods.

Akron-Williams

TIRE REPAIR EQUIPMENT

Used, Sold, and Recommended by All Leading Tire Companies

Learn Repairing in the Tire Factories

We have completed arrangements by which purchasers of Akron-Williams equipment may receive thorough and practical instruction in all branches of tire and tube repair work in the big tire factories.

Furthermore, we are constantly in touch with the best openings for both new and established tire repair shops all over the country — and we help buyers of Akron-Williams equipment to get located where opportunities are BEST.

Men of All Ages Make Good

Thousands of men—young, middle-aged, and over — have gone into Tire Repairing from all other occupations, and *made good.* Almost any industrious man desiring to better his position in life can do the same. We will help you, if you mail this coupon—**Now**

THE WILLIAMS FOUNDRY & MACHINE COMPANY
50 Cherry St., Akron, Ohio, U. S. A.
Gentlemen: You may send me Free, your catalog and further information.
Name.....
Address.....
City.....
State.....

The Williams Foundry & Machine Company
50 Cherry Street AKRON, OHIO

Every Hand in the Land!

Every Hand a Saving Hand
Every Hand a Helping Hand

Lend Your Quarters to Uncle Sam

Every One of Us Must Save Here for Victory "Over There"

EVERY one must lend some money to the Government. And every one can lend some, if only a little. No matter how slim our purse or how small our earnings, each and every one of us can spare a little for our Government if we practice a little thrift.

By investing in WAR SAVINGS STAMPS the person with only a few cents to spare can do his or her share as well and as nobly as the man with a million to invest. Remember, the Government does not ask you to give your money, but to lend it at interest. You make it work not only for those "over there" but also for you here, no matter how much or little it may be.

You may purchase WAR SAVINGS THRIFT STAMPS by paying the small amount of 25 cents at a time. Sixteen Thrift Stamps, plus a few cents in cash, are exchangeable for a Five Dollar WAR SAVINGS STAMP.

The Five Dollar Stamps cost from $4.17 to $4.23 each, according to the time purchased, and will be redeemed on January 1, 1923, at $5 each.

The Stamps will be sold during June, 1918, at $4.17 each, and the price will increase one cent a month during 1918.

At the average 1918 selling price, WAR SAVINGS STAMPS will yield you on the redemption date four per cent interest compounded quarterly. In case of necessity they may be redeemed before January 1, 1923, with about three per cent interest.

The investment is the soundest on earth. The entire wealth and security of the United States is back of them.

WAR SAVINGS STAMPS are as easy to buy as postage stamps. They are sold at post offices, banks or trust companies, many railway stations, stores, factories, agencies and other public places.

LET'S ALL INVEST and HELP—EVERY HAND in the LAND

National War Savings Committee, Washington

Contributed through Division of Advertising

United States Gov't Comm. on Public Information

W.S.S.
WAR SAVINGS STAMPS ISSUED BY THE UNITED STATES GOVERNMENT

This space contributed for the Winning of the War by
The B.V.D. *Company, New York.*

THIS new Six so completely meets the requirements of quality, appearance, price, economy, room, comfort and speed that it has been called "the ideal five-passenger car." Its lines are clean-cut and aristocratic. It is the most economical Quality Six on the market. Its quick acceleration and hill-climbing qualities are remarkable, and it combines speed with comfort. Simple, accessible, and easy to drive.

Beautiful in design—Thoroughly modern—Mechanically right

STUDEBAKER

Detroit, Mich. South Bend, Ind. Walkerville, Ont.

Address all correspondence to South Bend

BEST IN THE LONG RUN
FAIR TREATMENT
"When Spring unlocks the earth
to loose the smiling flowers"
WHEN blooming orchards, and the green bosoms of the hills call you to the open, and you speed your motor car to the country, sweet with the breath of new things, be sure to make your first flight of Springtide on Silvertown Cord Tires.
Half your joy, as you read the joyous book of Spring, writ in blossoms, lies in Silvertowns, the graceful, patrician tires with the Red Hallmark of tire quality—the Red Double Diamond—inlaid in the side wall.
Buoyant as the Spring air, they give you the leaping joy of ease and comfort. They add the calm joy of security.
For the durability and dependability of SILVERTOWN CORDS, along with BLACK SAFETY TREADS, have been proved by Goodrich Test Car Fleets. They measure up to the new tire standard, which includes all standards, the TESTED of—
GOODRICH
TESTED TIRES
THE CITY OF GOODRICH · AKRON, OHIO.

Stop those Leaks

THE easiest and quickest way of repairing leaks in radiators, pumps, water jackets, hose connections, etc., is to use Johnson's Radiator Cement. This will stop the leaks instantly without laying up the car. No mechanical experience is required—all you have to do is to remove the cap and pour the liquid into the radiator.

JOHNSON'S RADIATOR CEMENT

Johnson's Radiator Cement blends perfectly with the water until it reaches the leaks—just as soon as it comes in contact with the air it forms a hard, tough, pressure-resisting substance which is insoluble in water and consequently makes a permanent seal.

Quick—Efficient—Harmless

Johnson's Radiator Cement contains nothing which can coat or clog the cooling system. It will seal leaks in from two to ten minutes.

Quarts..$1.75 Pints..$1.00 Half-pints..65c

If your dealer cannot supply you, send us $1.00 and we will forward you a pint all charges prepaid.

Write for our folder on *"Keeping Your Car Young."*—it's free.

S. C. Johnson & Son, Dept. R, Racine, Wis.

NOW that discretion is the better part of buying, men and women should learn the difference between this pure-dyed silk hosiery and "loaded" silk hose. The soft effulgence and the grace of Luxite Hosiery commend it to all who have an eye to beauty. And its unrivaled serviceability prompts them to recommend it.

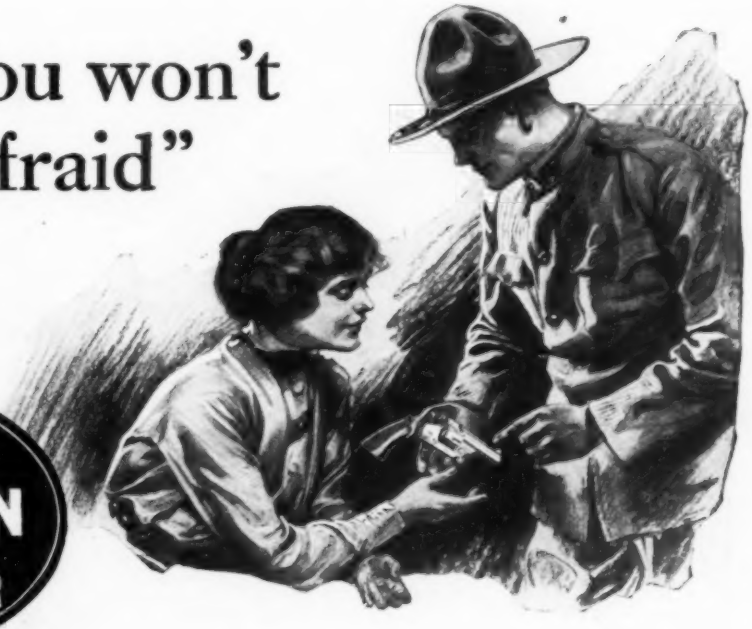
So Luxite has become the great American hosiery success—and is, today, an international favorite. Ask your dealer to supply you. If he cannot do so, write for price list and descriptive booklet today.

LUXITE TEXTILES, Inc., 645 Fowler Street, Milwaukee, Wisconsin

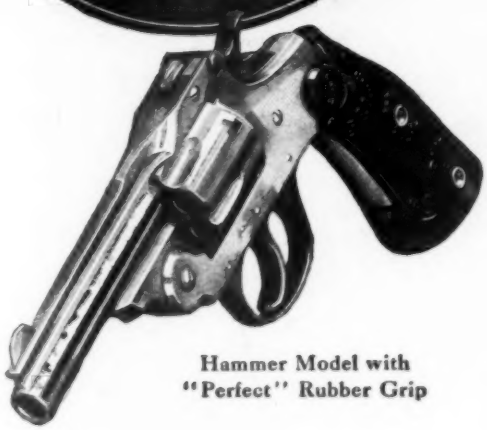
New York Chicago *Makers of High Grade Hosiery Since 1875* **San Francisco Liverpool**

LUXITE TEXTILES OF CANADA, Limited, London, Ont.

"Now you won't feel afraid"



IVER JOHNSON
Safety Automatic **REVOLVER**



Hammer Model with "Perfect" Rubber Grip

THE thoughtful soldier gives his wife a good automatic revolver before he joins the colors.

The family is safer with a reliable, dependable revolver in the house — a weapon that makes your home safe for you and yours, but dangerous to the marauder.

An Iver Johnson Revolver is safe—for the one who owns it. You can drop it, throw it about, even "Hammer the Hammer"—it cannot shoot accidentally. The only way to discharge it is by a pull on the trigger.

Go to an Iver Johnson dealer today — you will see how an Iver Johnson Revolver gives security. Buy a safe revolver today, for to-night it may be your turn to defend your loved ones against the aggression of the burglar.

Three Iver Johnson Booklets Sent Free

They will tell how to make dollars go farthest in buying revolvers, shotguns, and cycles. Indicate which book you want: A—"Arms," B—"Bicycles," C—"Motorcycles."

Iver Johnson's Arms & Cycle Works
307 River St., Fitchburg, Mass.

New York, 99 Chambers St. **San Francisco, 717 Market St.**

DU PONT AMERICAN INDUSTRIES

Exquisite IVORY PY-RA-LIN

Mark X before subject that interests you and **Mail This Coupon** to

E. I. Du Pont De Nemours Co.
Advertising Division
Wilmington P.M. Delaware

___	Challenge Collars
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___	Craftsman Fabrikoid
___	Industrial Dynamites
___	Trapshooting
___	Commercial Acids
___	Bronze Powder

Name _____

Address _____

City _____

State _____

The Appropriate Birthday Gift

America's fairest women know but one toiletware. The rich beauty and willing service of IVORY PY-RA-LIN hold it always in first consideration.

Lace work from old Bruges, rarest scents of the far east, or silks wonderful as the morning, look for the companionship of IVORY PY-RA-LIN. There rest harmony and taste. IVORY PY-RA-LIN, in the home, is a token of refinement.

Always on display in the better stores—each genuine piece daintily stamped with the name, IVORY PY-RA-LIN.

A brochure upon request.

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Owned and Operated by

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Visit the Du Pont Products Store, 1105 Boardwalk, Atlantic City, N. J.

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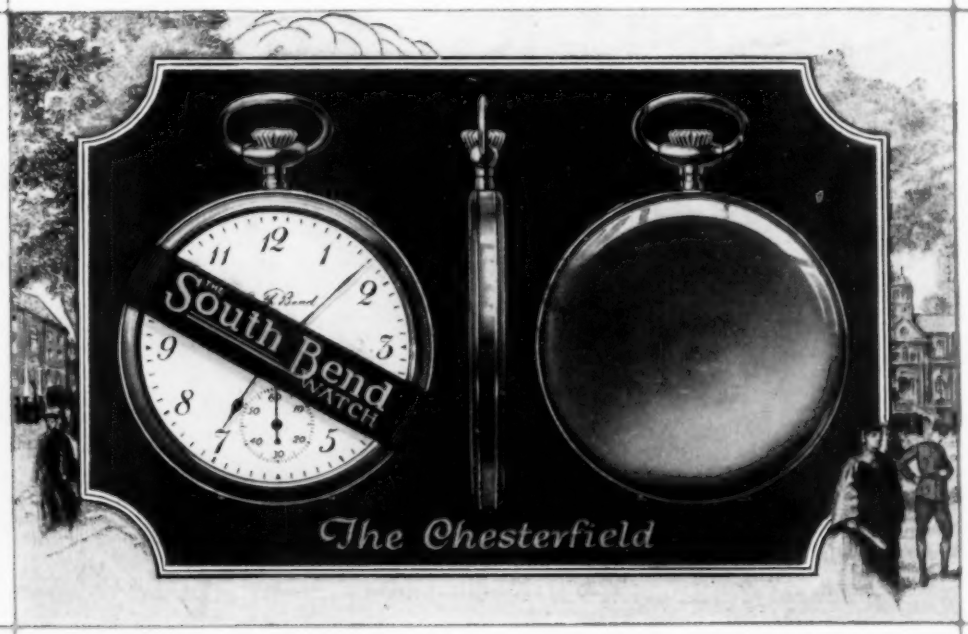
The Triumphal March of
Bevo
REG. U.S. PAT. OFF.
THE BEVERAGE
America's Soft Drink Supreme
I Came - I Saw
I Conquered
Milk or water may contain bacteria: Bevo never does.
Approved for use by the Government and immensely popular in the U. S. Cantonments and on Men-o'-war.
ANHEUSER-BUSCH
ST. LOUIS
The new eight-million-dollar Bevo bottling and shipping plant—largest in the world. Contains 26 acres of floor space—capacity of 2,000,000 bottles a day—employment of 2,500 persons.



At Graduation —

THE most appropriate and most appreciated gift is a high-grade watch. In mahogany-finished, velvet-lined gift boxes and encased in distinctively designed, hand-wrought Solid Gold cases, the 21-Jewel *Extra-Thin* South Bend Chesterfield Watches at $125, $100 and $80, and the 17-Jewel models at $75 and $55, offer accuracy and beauty usually found only in more expensive timepieces.

There are other Chesterfield models, also, at almost any price you wish to pay. All are *Extra-Thin*, stylish and handsome; and all are dependable timekeepers.

See them at your jeweler's. "A Book of Beautiful Watches" will be sent you on request.

SOUTH BEND WATCH COMPANY
26 Studebaker Street, South Bend, Indiana
For Years, Makers of Standard Railroad Watches

South Bend

The Watch with the Purple Ribbon

Nine o'clock and no washwoman yet!

IS washday the big problem of the week in your home? It need not be. You can solve it as well as your servant problem by using the

Western Electric

Washer and Wringer

It does the hard work. It washes the clothes in a revolving cylinder of hot suds so that there is no wear or tear on them, and it does it all at a cost of about 3 cents for the average family's wash.

With the Western Electric Iron to help, the ironing is quickly and pleasantly done, while the Western Electric vacuum cleaner, portable sewing machine and other household appliances all help you manage your home in an up-to-date business fashion.

Let electricity help you meet your particular problem this summer. Ask for Booklet No. 21-AW

WESTERN ELECTRIC COMPANY
INCORPORATED

New York Chicago Kansas City San Francisco

Houses in all Principal Cities

WESTERN ELECTRIC COMPANY Inc.

Gentlemen:
Please send me Booklet No. 21-AW describing your electric Washer and Wringer.

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Address_____

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PATENTED Holder Top Shaving Stick

THE only purpose of the Holder Top is to add convenience to a shaving necessity. Thousands of men would use Williams' Shaving Soap if they had to hold it with a forked stick. It's that kind of shaving soap. No amount of inconvenience in applying it would outweigh the comfort, economy and effectiveness of its softening, soothing, lasting lather. When you realize that Williams' Shaving Soap is *that* good, then you begin to appreciate what a real luxury Williams' Shaving Soap is when applied with the convenient metal Holder Top.

Send 20c. in stamps for trial sizes of the four forms shown here. Or send 6c. in stamps for any one.

The J. B. WILLIAMS CO.
Dept. A,
Glastonbury, Conn.

After the shave you will enjoy the comforting touch of Williams' Talc. Send 4c. for a trial size of the Violet, Carnation, English Lilac or Rose.

Please Mention Popular Mechanics

Put This War-Tire on your Bike

War-time calls for war-tires. Vitalics are war-tires in every sense of the word. They contain all the fleet, rugged toughness required in the hard grind of the bicycle squad at the front.

Put Vitalics on your wheel. They will make you jump joyously into the saddle and keep yourself fit and hardy for your share in the war when your time comes—if it does come.

The famous Vitalic De Luxe has struck a big, new note in bicycle tires. It is an automobile tire in virtually everything but size. We build it with the same care and with the same choice rubber and stalwart fabric that goes into auto tires.

VITALIC Bicycle Tires

This great tire has been adopted as standard equipment by the foremost bicycle manufacturers. It is everything that we know how to build into a long-mileage, puncture-resisting, smooth, fleet, non-skid bicycle tire. It is the favorite tire with the most experienced riders everywhere. It stays in service long after inferior tires have petered out. Its rugged riding qualities and long life will save you many a dollar.

The Vitalic line embraces single tube, racer, and clincher types—all leaders in their classes—all contain carefully selected rubber, fabric, and design. Inspect and test Vitalic quality at your dealer's today. The tires are right and the prices are right.

SEND TODAY for FREE Vitalic testing section and booklet, "Tougher Than Elephant Hide." Please give name and address of your bicycle tire dealer.

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TOOLS
Starrett Tools
Assurance of Accuracy
Perfect confidence in the accuracy of a rule, tape or level is vital. Such assurance comes through the name Starrett and the knowledge that every tool bearing that name is warranted.
A wide variety of styles and sizes of tools are described in Catalog No. 21AP which is sent free on request.
THE L. S. STARRETT CO.
The World's Greatest Toolmakers
Manufacturers of Hack Saws
ATHOL, MASS.
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I am $5,000.00 Better Off Said Gibbard

I call to you Men of action to read this message. The above is the statement of an honest, straight-forward American Citizen. I am putting it to you without one added stroke to give it embellishment. I reproduce here the picture of Mr. N. E. Gibbard, Charlotte, Michigan, his place of business and his exact statement. He says "I am $5,000.00 better off than eighteen months ago when I bought a Haywood Tire Repair Equipment." MEN — young — middle age—old men beyond the draft age—Men who are now in business or working for wages, here is a real sincere business success open to you. I have 500 places to be filled now.

I Must Have 500 Men

to Fill These Places Within 60 Days

I have a big interesting book to send you—a book about tires—it tells all about them—how they are repaired by Haywood method—explains this business—gives inside figures and profit. Gives actual proof of success—letters of others who are now operating Haywood Shops and making big money. What these men have done you can do. $2500 to $4000 a year is conservative. One machine will give you a start. You can see business around you—everywhere there are automobiles there are tires that need repairing. You know that. All you do is open a shop—put out a Haywood sign, and auto owners will come to you, welcome you and the service you bring them. If you haven't seen the "Sign of the Man and Machine" there is a big opportunity awaiting you.

Sign the coupon and mail it today, or send a post card or letter.

M. HAYWOOD, Pres.

HAYWOOD TIRE & EQUIPMENT CO.

473 N. Capitol Avenue INDIANAPOLIS, IND.

WRITE TODAY

OPPORTUNITY COUPON

M. HAYWOOD, Pres.
HAYWOOD TIRE & EQUIPMENT CO.
743 N. Capitol Avenue, INDIANAPOLIS, IND.

GENTLEMEN: Please send full particulars of your Scientific Tire Repair Service and details of your co-operative plans.

Name.....

Address.....

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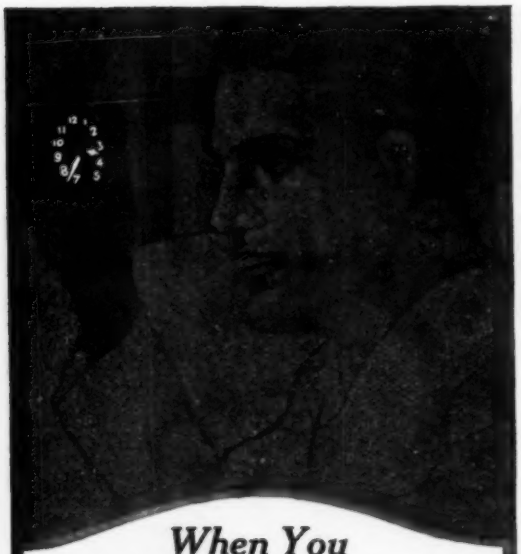

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YOUR Ingersoll Radiolite shows you the correct time in the dark as clearly as by day. Genuine Radium in the substance on the hands and figures makes them shine like fire in the dark.

Ingersoll Radiolite

The Day-and-Night Watch

The makers of fifty million watches and fifty million satisfied customers guarantee the timekeeping qualities and the continued luminosity of all Ingersoll Radiolites.

See the Ingersoll Radiolite at **$2.25**. The Ingersoll Waterbury Radiolite, a jeweled movement in a stylish small size solid nickel case, sells at **$4.50**. Sold Everywhere.

The Only Radiolite is the Ingersoll Radiolite

Robt. H. Ingersoll & Bro.
New York Boston Chicago
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$2.25
($2.50 in Canada)

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"I recommend the Eldorado," writes the Engineer of a big paper company, "as the best pencil for fine line drawing. The hardness of the lead is uniform and very strong."

DIXON'S ELDORADO

"the master drawing pencil"

is praised by concerns in almost every industry for the fine line drawing of the harder grades, and for the responsiveness of the softer leads.

Among the 17 degrees is a pencil for every purpose.

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ELASTIC KNIT
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The Greatest Value Winter Underwear ever sold at Popular Prices.

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THE RUDOLPH WURLITZER COMPANY, Dept. A419
South Wabash Avenue, Chicago — East Fourth Street, Cincinnati

Mr. Frank W. Potts, formerly with the Ford Automobile Company, wrote us the other day as follows:

MR. JOHN A. TENNEY, President, National Aero Institute, Chicago, Ill. Detroit, Mich.

Dear Mr. Tenney: Today I have entered the employ of the Packard Motor Car Company to work in the Experimental Aircraft Department. I had my first big opportunity to see and look over the wonderful Liberty Motor. I am only too glad to say that I owe this wonderful opportunity to the National Aero Institute and to my study of your great Course. It was through your influence with the Packard people and the fact that I was thoroughly interested in aeronautics that I was able to get this position. I feel that I am on the road to a genuine success, and I owe it all to the National Aero Institute. Am sending under separate cover the enrollment of a new student. Sincerely yours, FRANK W. POTTS.

Men Wanted!

The U. S. Government plans to send thousands of men to Europe who will be competent to keep its great airplane fleet in good working order—a great mechanical army which will be as important in its way as any other branch of the service.

We Teach You Aviation by Mail at Home

Study in spare time. Your training will be under the direction of experts—men who have great reputations in the field of aeronautics.

Send Coupon for FREE BOOK

Just write your name and address in the coupon and send it to us. We will send you our free book, "THE SCIENCE OF AVIATION," and our Special Limited Offer on our complete Mail Course. This book will tell you of the many big opportunities you will have in this great new industry. Tear out the coupon and mail it today. DO IT NOW!

NATIONAL AERO INSTITUTE
Dept. 1196, Morton Building, Chicago, Illinois

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Gentlemen: Please send me, absolutely free and prepaid, your new book on the Science of Aviation; also particulars of your Mail Course in the Principles of Aviation and special limited offer.

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DIAMOND Banking is the business of a million dollar firm over 60 years old. *We lend money*, accepting high-grade diamonds, etc., as security. When loans remain unpaid we must sell to get our money. **Most amazing bargains** proved by customer's letters. Diamonds, Rings, Pins, Brooches, Pendants, etc., at **prices we challenge you to match at 60 per cent more**, sent for **absolutely free examination.**

Write for JOS. DeRoy Bulletin

Send your name today and we will send you our bulletin of bargains showing hundreds of unpaid loans. It is absolutely free. Write today.

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The Genuine MUNSON LAST Worn by Our Soldiers

1. Built of selected leather. Pliable, wear-proof sole.
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3. Looks good. Wears long. Easy as velvet.

FOR MECHANICS, SPORTSMEN, BANKERS, POSTMEN, FARMERS.

Comfort—Health—Wear
Style—Service—Saving

$5.00 Post Paid

Guarantee This is the U. S. Army Shoe. We guarantee to fit you by mail. Your money will be cheerfully refunded on request if these are not all we claim.

U. S. Army Doctors prescribe this last for your feet! Every pair is honestly built of honest leather. They look good. They **wear!** You save $3. Be good to your feet and order a pair, **Now!**

All Sizes—Tan Army Color

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Beach and Albany Sts. BOSTON, U. S. A.

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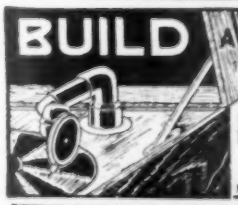

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Send 10 Cents for Circulars.

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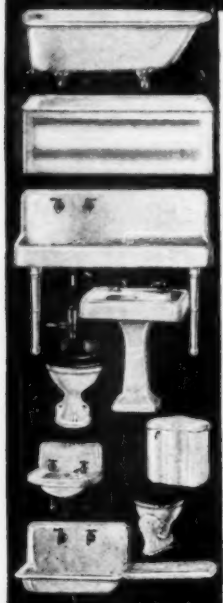
The Prophylactic Tooth Brush

Earned its reputation by "mouth to mouth" advertising

DO YOUR OWN PLUMBING HEATING-HARDIN EASY WAY



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This method is perfect, simple and easy. It helps you select the proper **plumbing, hot-air, water** or **steam** cut-to-fit heating plant. Has many practical plans, diagrams, sketches, elevations, etc., showing how to do the installing or repairing our new, original, practical cut-to-fit way. (No loss or waste.) Any handy man with a few tools can do the work with the aid of this

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WRITE TODAY.

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$500,000 Plants Behind Our Guarantee

Guaranteed Costs!

Over 100,000 customers have saved from $200 to $500 each, building the Gordon-VanTine way.

Send today for free book—200 plans—"Gordon-Van Tine Homes." Shows bungalows and houses, $300 up. All *wholesale*. Ready-cut or not ready-cut. *Highest quality material* supplied complete. No extras. Prompt delivery anywhere. *Write for Book.*

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Model No. 5.—Perfect machines only of standard size with keyboard of standard universal arrangement—has Back-spacer—Tabulator two color ribbon—Ball Bearing construct on—every operating convenience.

FIVE DAYS' FREE TRIAL. Fully guaranteed. Catalog and special price sent **FREE.**

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BUTLER CANNING OUTFITS

Are simple, economical, practical. Operate easier and quicker than old-fashioned methods. Made for home, club or commercial use. Many were disappointed in not getting an outfit last year. Expect bigger demand this season. Be safe, investigate now. Write nearest factory for free catalog and prices. **Good Deal for Live Agents in Open Territory.**

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Please check whether interested in a new or old instrument. New Violin____. Old Violin____.

If a violin teacher, let us include your name in our teachers' list now being compiled.

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Multiplies—Subtracts

INVALID WHEEL CHAIRS at Manufacturer's Prices

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Fits you for Harvard, Yale, Princeton and other institutions of highest standing. Helps you to **win** in business and social life. Spend the hours you would otherwise waste, in profitable study of this fascinating course.

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This course gives you the **key to success and power.**

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giving full information about High School Course and many others. Check on coupon the course in which you are most interested and **mail now.** Write name and address carefully.

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Dept. P-119A. Gentlemen: Please send me booklet and tell me how I can fit myself for the position marked X.

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.....Telephone Engineer	.....Business Manager
.....Architect	.....Auditor
.....Draftsman	.....Certified Public Acc'nt
.....Building Contractor	.....Stenographer
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.....Civil Engineer	.....Sanitary Engineer
.....Steam Engineer	.....Automobile Engineer

NAME.....

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—that NOW as other watch prices are going higher and higher, that we should be able to sell the Famous "Santa Fe Special" so much lower than other makes. In the very face of advancing prices of labor, material and everything else

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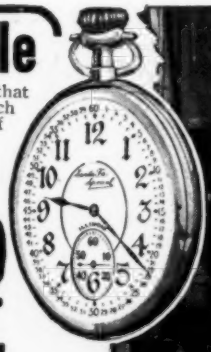
We can do this simply because we are **sacrificing ALL PROFITS** to thoroughly introduce the standard watch. It is an opportunity of a lifetime.

LOOK The ILLINOIS Famous Santa Fe Special 21 JEWEL RAILROAD WATCH $2.50 A MONTH



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Our "Direct-to-You" low wholesale terms and **Extra Special Distribution Plan** is fully explained in the **new** Santa Fe Special booklet just off the press. The "Santa Fe Special Plan" means a **big saving** of money to you and you get the BEST watch value on the market today. **WATCH SENT FOR YOU TO SEE WITHOUT ONE PENNY DOWN.**

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You must see these remarkable watches in order to fully realize the marvelous beauty of these NEWEST DESIGNS, see the 3-color inlay work, think how distinctive your watch will be with your own name, monogram, or an emblem inlaid in the solid gold. See the special New French Art designs in watch cases, or any special emblem or monogram combined to suit you. Don't wait, write for the FREE Watch Book Today

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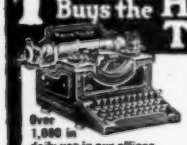

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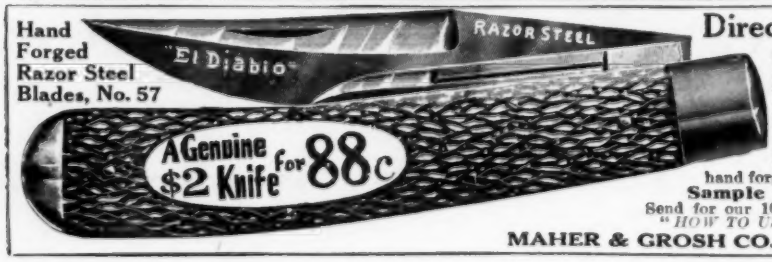

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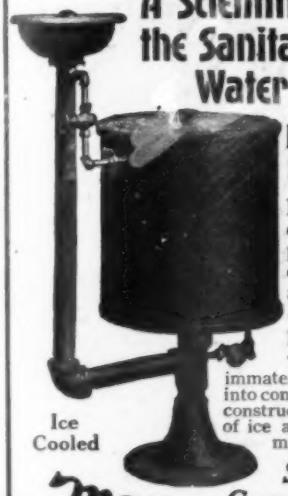

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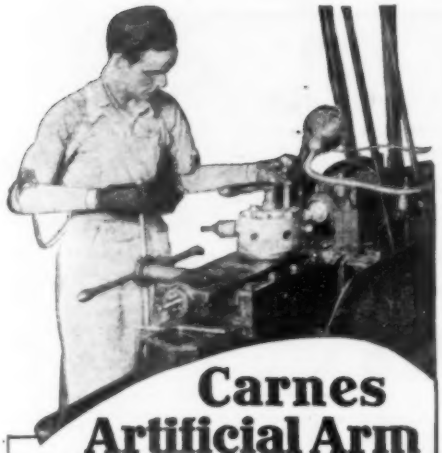

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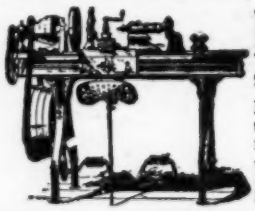

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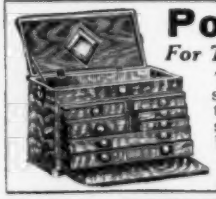

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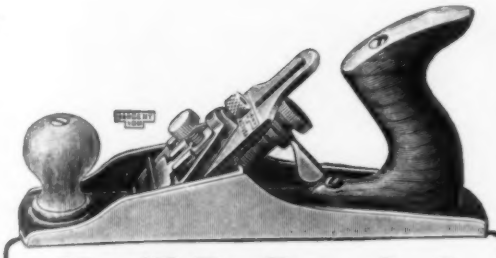

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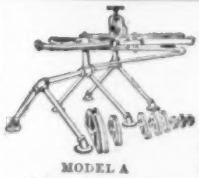

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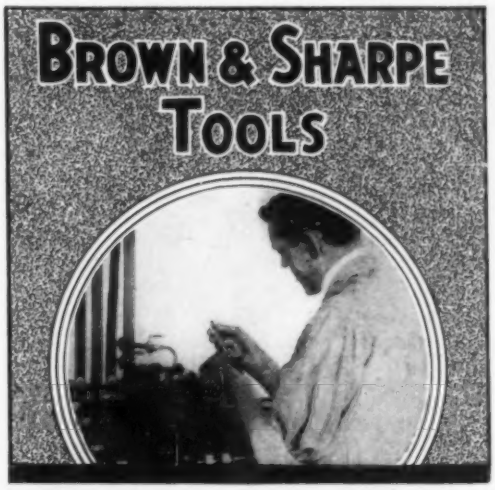

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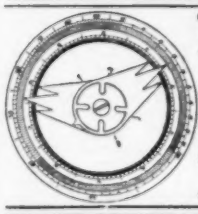

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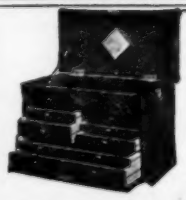

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Mfrs. of Mechanics' High Grade Tool Cases
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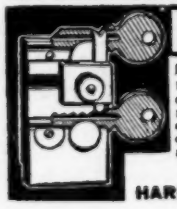

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The tool is so designed that the saw teeth are in plain view which enables the user to quickly adjust the tool to the tooth to be set.

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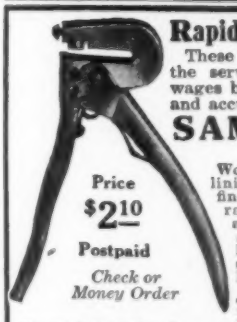

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Automatically and instantly adjusts to various sizes and locks in any desired position. Quick—Strong—Durable—Efficient—Simple—Positive Grip. Cannot unhook. Size 7 in. from Bell crank to Hook which opens to 10 in. 3 long arms also furnished, open to 18 in.

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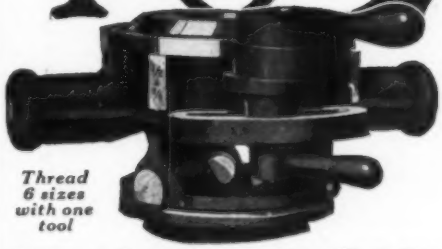

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A flaming torch. New firing force. Revolutionizes ignition in gasoline engines. A firing flame instead of your tiny spark.

Shaw's Hot Firing Tube

changes your spark to a spreading flame. Consumes all the gas. Keeps your spark plugs clean. Keeps your cylinder clean. Puts more power in your engine with less gas. Quicker pick up. Gives you better control of your car. **Get a set today.**

Shaw's Hot Firing Tubes put a powerful flame in the cylinder on every spark. Instantaneously fires all the gas. Marvelous increase of power in every explosion. Put this high-speed firing system on your car now. Do it today.

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for Ford Cars. Automatically holds your car straight in the road. Gives you perfect control. Takes all the quiver out of the steering wheel. Best safety device ever put on a Ford Car. Goes on your car without nut, screw or bolt. Can be installed in 10 seconds.

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BUY A SET TODAY.

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Sells for $100 less than any other make of equal daily capacity. Liberal contract for fit men. Best states still open.

Act quickly and get into the Summer drive.

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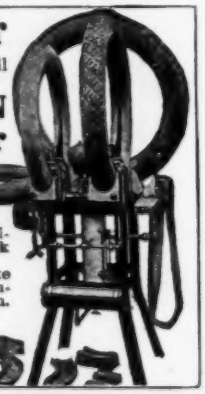

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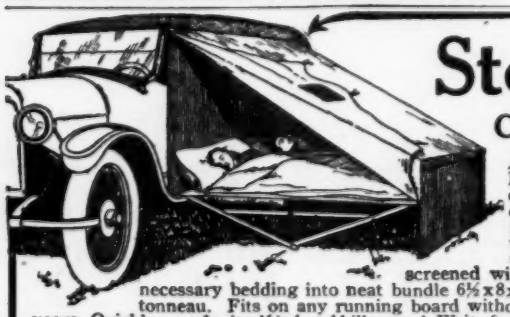

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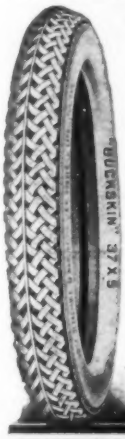

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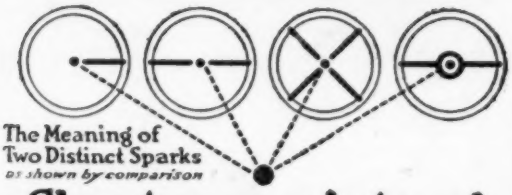

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Short one point and-

the ordinary spark plug is dead—it cannot possibly fire until the soot or oil is removed. No matter how many firing points the ordinary plug has, it is no more dependable than a single-point plug, because electricity follows the path of least resistance—

but with **TWIN FIRE**

each of the two firing gaps sparks independently of the other. Short one point of Twin Fire and the other continues to fire—the hot explosions soon clean the fouled point. It gives greater dependability, more power, less carbon, greater economy—all with the same amount of current ordinary plugs use. It fires two-series sparks. See your dealer today—he will gladly prove Twin Fire superiority. The price is only $1.00.

Twin Fire Spark Plug Co.

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DEALERS: Ask for particulars of our dealer plan. Twin Fire sales are increasing daily. Also ask about the demonstration outfit. Write today.

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75 MILES to the gallon

has again won the 24-Hour Championship. Low first cost, Low up-keep, Endurance and plenty of speed make Cleveland Motorcycle the most practical product on the market.

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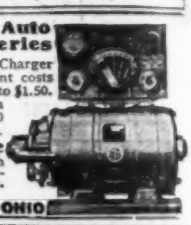

Figure it out for yourself. This 500 watt Battery Charger will recharge 1 to 7 batteries at a time. Current costs only 12c to 15c per battery. Autoist pays 25c to $1.50. Your profit is 60c to $1.35 on every battery you charge. Other HB owners are making $40 to $60 and more clear profit every month. So can you.

$15 Puts This Money-Maker in Your Garage

Balance in 9 monthly payments of $20 each, which earnings should easily pay. Write for full particulars or send $15 first payment with trial order.

No Risk. Absolute Money-Back Guarantee.

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100% THIEF PROOF AUTO LOCK $10

Shuts off gas supply-Locks the heart of your car

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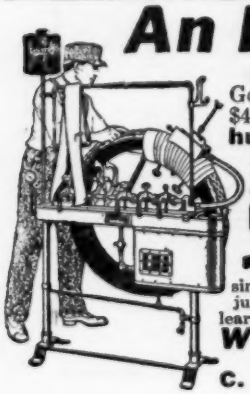

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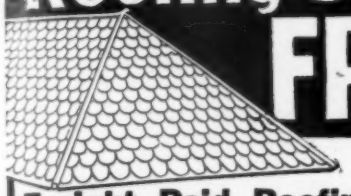

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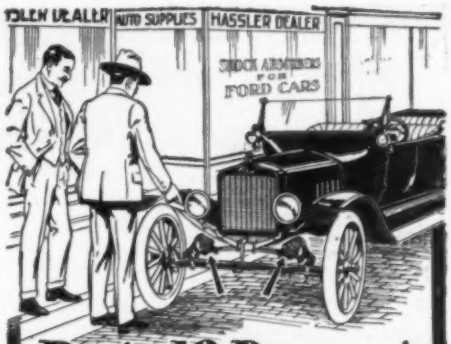

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ELECTRIC BICYCLE LIGHT

Floods the road with light 300 feet ahead. Cheap as oil or acetylene and more reliable. No dirt, grease, oil or matches. Uses ordinary dry cells which "burn" for months. Handsome, neat, easy to attach to the handle-bar. 90% of all electric bicycle lights are DELTAS! See your dealer. Write for illustrated circular.

Prices Including Batteries:			*Canadian Prices Not Including Batteries:*		
No. 28	(2 cell)	$3.00	No. 28	(2 cell)	$3.85
No. 28A	(2 cell)	3.25	No. 28A	(2 cell)	3.65
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DELTA ELECTRIC CO.

Dept. 67 Marion, Indiana

Manufacturers of the World's Standard Battery Lamps for Autos, Boats, Buggies, Bicycles and Hand Use.

$1 A Week buys the Black Beauty

Snappiest, raciest, best-built bicycle money can buy; a thoroughbred, indeed—the Black Beauty! And the Plan for getting it is a beauty, too! No need to "save up" before ordering. Send no money. **WRITE TODAY** for the Black Beauty Catalog (in colors). FREE. Pick your model; we ship. You risk nothing. You get the "bike" at once; pay later, as you use it, in sums so small you won't feel the expense. **Months** to pay!

Black Beauty has *18 exclusive features*, including:

$9.00 Vitalic Non-skid Tires

—the longest-lasting, easiest-riding tires made And the springiest saddle, surest coaster brake, best steel bearings obtainable; "finger" grips; 12-arm "B-B" sprocket; reinforced frame; braced front fork; motorbike handle bar; dove-tail color design, etc. **Guaranteed Five Years.**

Shipped on Approval

Factory Direct Freight Prepaid

Costs you nothing to examine it; no risk. You may keep it, paying small deposit, then $1 a week; or return at our expense. Simple; easy! Factory price—no middlemen; no dealer's profit. Don't delay. Get the Catalog, then get the bicycle.

SUNDRIES Save money. Get our factory-price Sundries Catalog. **Free.** Everything for cyclists—Tires, Lamps, Horns, Bells, Pumps, Grips, Saddles, Handle Bars, Pedals, Repairs, etc.

Haverford Cycle Co. (Estab. 22 yrs.) **Dept. F29, Philadelphia**

$40 Motorcycle

We have the largest line of new and used motorcycles in the country at the lowest prices. Every machine guaranteed. Send for catalog. We are the largest and only exclusive motorcycle supply house in the world. Repairs a Specialty. Send us your machine to be overhauled. Motors and castings for airships and railway velocipedes. WE EXCHANGE MOTORCYCLES.

HARRY R. GEER CO., 888 McLaran Ave., St. Louis, Mo.

MAKE YOUR BIKE A MOTORCYCLE

at a small cost, by using our attachable outfit. Fits any Bicycle. Easily attached. No special tools required.

"Used His Four Years"

Harry A. Hyatt, of Boreas River, New York, writes: "About four years ago I received my motor attachment, and wish to say that I am satisfied with it in every way, for it has certainly given me good service. Anyone wanting a motorcycle or attachment, I would recommend them to the Shaw Manufacturing Co."

FREE BOOK Write today for bargain list and free booklet, fully describing the SHAW Bicycle Motor Attachment. Motorcycles all makes, new and second-hand, $35.00 up.

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You need a strong, dependable screw-driver for those "odd jobs."

This one is drop-forged from oil-tempered steel, and tested for tremendous strain before leaving the factory.

Note the adjustable handle. Just snap it crossways and you can drive a screw into hard wood with ease.

Get one from your hardware dealer today. We authorize him to pay you back your money if you are not satisfied. Three sizes—65c, 70c, 75c.

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Jamestown, N. Y.

Crescent GUARANTEED Hamr-Handl screw driver

START A TIRE REPAIR BUSINESS

Make Big Money. Autos indispensable. Men over and under draft age can serve their country by helping to keep its motor assets fit. High price of tires means more tire repairing. Send for free booklet, "*Tire Repairing, the Business of the Times.*"

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939 Swaltzer Ave. AKRON, OHIO

ERECTOR THE TOY LIKE STRUCTURAL STEEL

BOYS: Write for facts about Gilbert Toys and get **Toy Tips**, the boys' magazine, FREE.

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The 1918 Harley-Davidson

Sturdy, speedy, surprisingly economical—for 16 years the Master Mount. Write for catalog

Harley-Davidson Motor Co.
521 B St., Milwaukee, Wis.

Try Before You Buy

Select the bicycle you prefer from the 44 styles, colors and sizes in the famous "Ranger" line. We send it on approval and **30 DAYS TRIAL**, *freight paid to your town.* Return if not pleased and the trial costs you nothing.

Write at once for large illustrated catalog showing *complete line* of bicycles, tires and supplies, and particulars of *most marvelous offer* ever made on a bicycle. You will be astonished at our ***low prices*** and *remarkable terms.*

RIDER AGENTS Wanted—Boys, make money taking orders for Bicycles, ***Tires*** and Sundries from our big catalog. **Do business** *direct* with the leading bicycle home in America. **Do not buy** until you ***know*** what we can do. *Write Today.*

MEAD CYCLE COMPANY
DEPT. W108 CHICAGO, U.S.A.

Why the *Dayton* Lasts so Long

DAYTON Bicycles out-live the ordinary bicycle because of superior design, better material and extra care in every detail of construction. We know of twenty-three-year-old DAYTON BICYCLES—still in service!

Dayton Bicycles

are made, throughout, of the best materials obtainable for the purpose. Drop-forgings and inner reinforcements play an important part in the long life of a DAYTON!

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WRITE FOR FREE CATALOG

Gives all DAYTON details and tells how to make money and save time with a bicycle.

Cycle Dept.
The DAVIS SEWING MACHINE CO.
DAYTON, OHIO

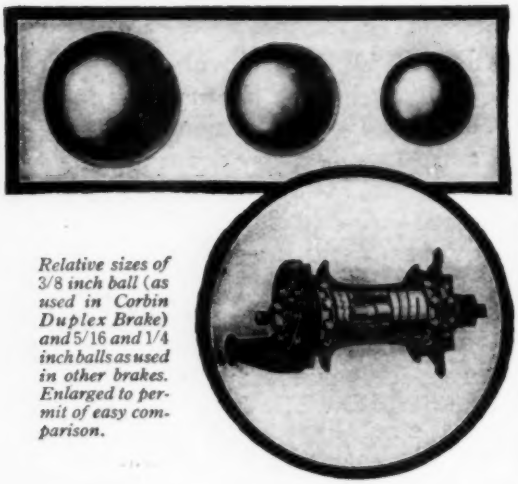
DAYTON FEATURES—Cones carbonized, then case-hardened in cyanide. Extra large, High Duty (AA) ball bearings. 2-Point Bearings, front and rear. Front hub and cup turned from solid steel. One-piece drop-forged crank.

[*See other features in Ad No. 6*]

Ad No. 5 of a Series

Please Mention Popular Mechanics

Why CORBIN CONTROL Means Safety Assured



Relative sizes of 3/8 inch ball (as used in Corbin Duplex Brake) and 5/16 and 1/4 inch balls as used in other brakes. Enlarged to permit of easy comparison.

THE Corbin Duplex bicycle brake is built oversize at every point where strain or wear is to be expected. An excellent proof is found in the size of the balls used.

This oversize policy is expensive for the manufacturer, but the best for you. It guarantees safety, comfort and long wear.

The bicycle, because of its economy and great utility, stands higher than ever before in the esteem of the nation, and the Corbin Duplex brake has helped to place it in that position.

In ordinary service slight pressure stops your bicycle slowly; in an emergency, harder pressure stops it instantly.

All riders who use their bicycles for everyday business or pleasure service need the Corbin Duplex. When purchasing a bicycle specify the Corbin.

Write for Catalog

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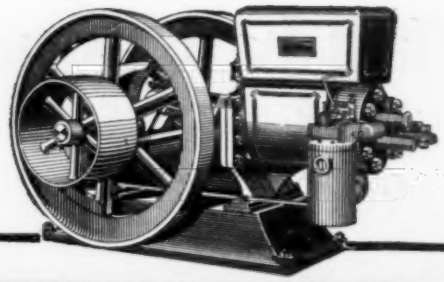
American Hardware Corporation, Successor

200 High Street, NEW BRITAIN, CONN.

Branches: **New York Chicago Philadelphia**



OTTAWA ENGINES

Kerosene Oil, Gasoline and Gas

Let me send you an engine to earn its own cost while you use it—for my Kerosene engine gives more power from a gallon of 6-cent kerosene than you can get from a gallon of 20- or 25-cent gasoline in a gasoline engine—Easy to start; easy to operate; no cranking; no batteries. All sizes—2 H.P. to 22 H. P.—Stationary, Portable, and Sawing Outfits. **10-Year Guarantee on Every Engine.** *Write for Latest Prices.*

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Ever since I started my factory, years ago, I have been selling engines direct from the factory to the man in the shop or on the farm. Now, as before, any honest man can have my engine on

90 Days' Trial Every engine I send out must make good all I guarantee. No need to pay double my price for any good engine, or take an out-of-date engine for any kind of a price. Let me show you how to figure what an engine is worth and

How to Know Better Engines

My newest book helps you choose a safe and value-received engine—How to make simple tests—and all about valve in head motor. Send me your address today. Just a postal card will bring this newest and latest book.

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Tells all about my Celebrated Steel Shoes. One of the greatest inventions in footwear the world has ever known. Over a million people now wearing them. Wear as long as three to six pairs of leather shoes. Easiest, most comfortable shoes you ever had on your feet. No cold, wet feet, therefore Colds, Rheumatism, Grip, Lumbago, Lame Back, and other ailments prevented. No corns, bunions or tender, tired feet. Write today for my free book.

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Work all or spare time. Own a business of your own. Akron Lighting Systems wanted in homes, stores, churches, public buildings. Best and cheapest light known. Uses common gasoline. Absolutely safe. Permitted by Insurance companies.

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Simple, dependable, durable. Has latest patented improvements. Gives abundance of bright, clear, soft, steady light which is restful to the eyes. Complete line portable lamps, lanterns. Fully guaranteed. Exclusive territory to Agents. Outfit Free. Write NOW for Catalog, agents proposition, all FREE.

Sold direct at wholesale price in open territory. **AKRON GAS LAMP CO., 686 Gas Bldg., Akron, Ohio**

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What a Joy It is

to be out on the water in a staunch, speedy Old Town, the master canoe! Sunshine, stimulating air and invigorating exercise. What Doctor can write a better HEALTH prescription?

Old Town Canoes are graceful, buoyant and beautifully balanced. Like a flash they respond to each stroke. Let an Old Town carry you far and near, for an all day paddle or a short run to a near-by cove and a hearty picnic lunch. Write today for catalog which also illustrates the "Sponson Model," the safest canoe in the world.

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FREE!—A Book on BOATS

Special Boats of 130 Leading Boat Builders. Gray 2 and 4 cycle Motor Engine Catalogue. Boat Models for work, fishing, cruising. Ask for them if you are interested in boating for pleasure or profit. Book 1 shows more boats than motor show.

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The LITTLE PET Engine

The right motor for any home, city or country.

Was especially designed for running home machinery like the washing machine, cream separator, fanning mill, small lathe, churns, pumps, and other machinery in the home workshop. Has special starter (no hand crank), combination countershaft for different size pulleys, speed adjustment while running, all moving parts enclosed, and special muffler makes it safe and quiet as a sewing machine. Develops better than ½ H. P. and is light and portable. Runs on either gasoline or city gas. Send for Catalogue "A."

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Racine Wis

America's Finest Canoe

Because it's built that way
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Caille Marine Engines Inboard Outboard

For Pleasure—Work—Speed

Each type of motor-boat requires a power plant of suitable style, horse-power and model, according to dimensions of hull, purposes used for and speed desired. The selection of the most suitable motor should not be guessed at, but should be the subject of careful consideration by experts. We manufacture the right motor for any power boat, whether used for pleasure, passenger traffic, heavy duty purposes, or fishing. Thousands of customers regard us as MOTOR BOAT HEADQUARTERS. By filling in the Coupon below you may have the services of our expert engineering staff **absolutely free.**

Marine engines in all sizes from 2½ to 30 H. P., both two and four-cycle models. Portable Motors for Outboard attachment in two distinct models. **Use the coupon now,** giving particulars of your Boat or the kind of motor you are interested in and get free catalog, information and advice by return mail.

THE CAILLE PERFECTION MOTOR COMPANY
26 CAILLE BLDG. DETROIT, MICHIGAN, U. S. A.

THE CAILLE PERFECTION MOTOR CO.,
26 Caille Bldg., Detroit, Mich., U. S. A.

Gentlemen: Please send to me, absolutely Free, information as checked below. I understand this information will be treated in confidence by your Engineering Department and will be used in giving me advice as to the best and most economical power plant.

Row Boat Motors
[ ] Caille 5 Speed
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[ ] Work Type
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Dimensions of boat—it is very important to give these:
Length.....ft. Beam.....ft. Draught.....ft.
Purpose used for: [ ] Work. [ ] Pleasure.
Speed desired.....miles per hour.

Name.....

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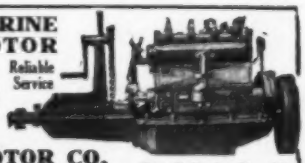
Universal MARINE MOTOR


Reliable Service

9-12 H. P. 4 Cycle 4-Cylinder. Speed range 300 to 1800 R. P. M. Adapted to boats from 14 to 30 feet. Write to

UNIVERSAL MOTOR CO.
OSHKOSH, WIS. Dept. P

For Bulletin No. 25 giving full description

More Power-Greater Speed!

The KOBAN gives you greater speed because its two cylinders produce more power. In every way, it is the motor for the man who demands real service and efficiency. The KOBAN **does not shake the boat,** because both cylinders fire at the same time, neutralizing the shock.

The Great 2-cylinder

KOBAN ROWBOAT MOTOR

Only by this 2-cylinder opposed construction can you avoid the vibration that makes riding disagreeable, opens seams and ruins rowboats. Special tilting device for shallow water and beaching. For commercial work the KOBAN is unequalled. Used by U. S. Government and in 36 foreign countries.

"Towed nine boats containing 25 people —over 6,000 lbs."—Kansas City, Mo.

Write for illustrated catalog.

Dealers and local agents wanted.

KOBAN MANUFACTURING CO.
291 South Water St., Milwaukee, Wis., U. S. A.

"He's After It!"

HE'S a big fellow, by the feel of him. Let him run awhile—then strike him hard! Fishing's great sport, isn't it?—especially when you have an

EVINRUDE

DETACHABLE ROWBOAT & CANOE MOTOR

Special method of balancing gives the 1918 Evinrude wonderfully smooth, vibrationless running. Equipped with Evinrude Magneto—Built-In Flywheel Type and Automatic Reverse.

New catalog just out—write for it.

EVINRUDE MOTOR CO.
854 Evinrude Block Milwaukee, Wis.
Branches:
New York, Boston, San Francisco, Portland, Ore. Toronto, Montreal, Victoria
Also Manufacturers of The Evinrude Oil Engine

"let's go fishin'"

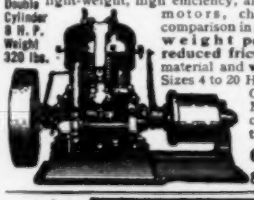
How many times have you made that suggestion since you were a boy in "knee pants?" Do you still heed the call of lake and stream and the great outdoors, bidding you come and drink deep from the one spring of eternal youth—clean, healthful sport in the open air? A day spent on the lake or river, matching your strength and skill against plunging muskies or fighting bass, those are the days that no one can afford to miss. A few moments practice with a South Bend Anti-Back-Lash Reel will make an expert caster of the most inexperienced. The use of the South Bend **BASS-ORENO** bait will coax the big gamey fellows to strike, as thousands of anglers have learned. See South Bend Quality Tackle at your dealers. Write to us for your complimentary copy of the book, "The Days of Real Sport," illustrated by Briggs. Full of fun and fishing information. Send dealers name.

SOUTH BEND BAIT COMPANY
3588 Colfax Avenue South Bend, Indiana

TRADE SOUTH BEND QUALITY TACKLE BAIT COMPANY MARK

4 H.P. Cushman Weighs Only 190 lbs. 8 H.P. 2 Cylinder Only 320 lbs.

Discussing light-weight motors recently, the Scientific American said: "Efficiency means light weight, reduced friction, and above everything else, lowered operating cost." Cushman Light-weight engines are today recognized as the leading American light-weight, high efficiency, all-purpose motors, challenging comparison in minimum **weight per horsepower, reduced friction, quality** of material and **workmanship** and **cost** of operation. Sizes 4 to 20 H. P. **Throttle Governor.** Schebler Carburetor. Forced Water Cooling System. Moving parts enclosed and run in bath of oil. **Not cheap engines,** but cheap in the long run. ENGINE BOOK FREE.



Cushman Motor Works
882 N. 21st St., LINCOLN, NEB.

MARINE ENGINES

3 H. P. single and 6 H. P. double cylinder, all iron or copper jacket, aluminum base, light weight, for canoes and small boats.
THE WATKINS MOTOR CO., 828 W. 6th St., CINCINNATI, OHIO

Engine User-Agents Wanted

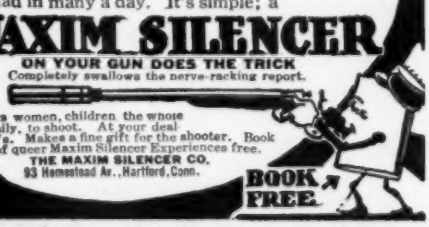
Men wanted in every county to USE, demonstrate and sell "BIG BEN"—wonderful new gasoline engine for every work. Big demand. Liberal profits. Free details and introductory offer. C. Beuningsofen & Sons, Department 511, Hamilton, Ohio.

Shoot Without Noise

Improve your aim, raise your score of hits, do away with wincing, and get more sport out of shooting than you've had in many a day. It's simple; a

MAXIM SILENCER

ON YOUR GUN DOES THE TRICK
Completely swallows the nerve-racking report.



Allows women, children the whole family, to shoot. At your dealer's. Makes a fine gift for the shooter. Book of queer Maxim Silencer Experiences free.
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BOOK FREE

Earn Money

this summer demonstrating the
Wisconsin Detachable Row Boat Motor
with woodless propeller; patented top adjustment; rudder steering or self-locking tiller. Exclusive, sales-making features; quick sales, good profits. Act at once. Get catalog. Write WISCONSIN MACH. & MFG. CO., Minor Street, Milwaukee, Wis.
Makers of Marine Motors for 14 years

A RARE SPORT

Simple, Speedy, No Vibration

Makes your canoe a fast power boat—The KOBAN is strictly a canoe motor—Opposed cylinders remove vibration—weighs only 60 lbs. —occupies little space—moderate price. Ask for Circular 80.
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KOBAN CANOE MOTOR

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FULL OF VALUABLE INFORMATION TO EVERY BOAT OWNER ON
RACING PROPELLER WHEELS, REVERSE GEARS AND MARINE ACCESSORIES
LARGE CATALOG FREE. SEND TODAY
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1139 MONROE AVE., GRAND RAPIDS, MICH.

How to Get Rid of Moles

A simple, safe home treatment—15 years' success in my practice. **Moles** (and other growths) **Dry Up.**
Ask for Free Booklet of Full Particulars.
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Something Different-Something Better $48.00
Liberty Drive Row Boat Motor

THE new motor for propelling rowboats. Attaches to any rowboat in one minute—by just turning up two thumb screws. Fuel tank quickly detaches for convenience in filling and for safety from thieves.

For Pleasure Fishing Hunting Business

4 New Exclusive Advantages

Direct drive from crank shaft to propeller; power—speed. Drives the boat anywhere it will float, over shallows, sunken logs, rocks. Goes thru weeds like an eel. Propeller shaft lowered and raised by pressure on steering handle, automatically lifts when propeller strikes an obstruction.

Liberty Drive is the only genuine tilting motor—you can drive your boat right upon the beach—no dock necessary. You can turn your boat in its own length, that's quick maneuvering.

Backed by the Caille Guarantee

Price fits any purse—simple design—simple to use. Drives an ordinary rowboat three to ten miles per hour. A postal brings you the catalog.

The Caille Perfection Motor Company
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DETROIT, MICH. U. S. A.

SAVE 25% to 60%

on slightly used
GRAFLEX-KODAKS

Cameras and Lenses of every description. Equal to new. Save money. Write now for **FREE BARGAIN BOOK AND CATALOG** listing hundreds of money-saving bargains in slightly used and new cameras and supplies. All goods sold on 10 days' Free Trial. Money back if not satisfied. You take no chances dealing with us. We have been in the photographic business over 16 years. Write now.

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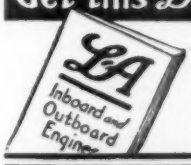
Get this LA Engine Book



—it gives valuable information about motor boat engines. It also describes the full line of L-A motors and tells of the 30 days' free trial plan. *Write for your copy today.*

LOCKWOOD-ASH MOTOR CO.
1830 Horton Ave. Jackson, Mich. (22)

Move Your Poultry Yard at Will

Make any size yard you want—move it where you want it. Ideal for fencing in chicks or ducklings, also grown chickens, ducks, geese, etc. Substantially made of 1½" Diamond Mesh, Heavy Galvanized Wire Fabric over galvanized frames—strong and durable. Easily, quickly erected.

100% Garden Protection

No chance for chickens, stray dogs, and cats to overrun or kill your plants. Enables you to use every inch of back yard.

		Per Section
7'	long x 5' high	$3.75
2' 6"	" x 5' (gate)	1.60
8'	" x 2' high	2.00
6'	" x 2' high	1.60

Plus 10% in the above prices.

"BUFFALO" TRADE MARK REG. U.S. PAT. OFF. PORTABLE

Minimum order six sections. Immediate shipment—special sizes to order on short notice.

Write for booklet 67KK, enclose 6c in stamps to cover postage. Best backyard equipment investment you ever made.

BUFFALO WIRE WORKS CO.
(Formerly Scheeler's Sons) 511 Terrace, BUFFALO, N.Y.

BE OIL WISE—GET 50¢ SIZE

You'll get as much 3-in-One as if you bought 8 of the 15c bottles. And 3-in-One never loses its quality—never thickens, gums or turns rancid. Always sweet, fresh and good.

3-in-One has for 23 years been the leading Household Oil—Lubricating, Cleaning and Polishing, and Preventing Rust.

Use for oiling sewing machines, bicycles, talking machines, guns, reels, locks, clocks, etc. Use for cleaning and polishing fine pianos, tables, chairs, any furniture. Use for preventing rust on any metal surface.

FREE On receipt of your dealer's name we will send you free of cost a generous sample bottle and the valuable 3-in-One Dictionary. Try this good oil at our expense.

3-in-One is Sold at All Good Hardware, Drug, Grocery and General Stores.

Three-in-One Oil Company
165 CNM. Broadway New York

HOW TO END CORNS

SAFE CERTAIN — HARSH UNSAFE — DANGEROUS TEMPORARY

Which Way for You ?

Above are pictured three ways to treat corns.

Blue-jay is the most certain. It is safe and gentle.

Yet the unknowing ones experiment with harsh, mussy liquids or the dangerous razor.

These two ways are temporary.

But Blue-jay is scientific. The spot of medicated wax, discovered by a great chemist, soothes while it works.

Place a Blue-jay Plaster on your throbbing corn tonight.

Relief is instant. The soft felt pad stops the pain by relieving the pressure.

In 48 hours the medicated wax has saturated the corn—undermined it to its roots—and it comes off painlessly, completely. Nature responds quickly to such a gentle corrective treatment.

Hardly a corn can resist. Of course once in a while there is an old, stubborn corn which requires a second or third application. But such are rare.

Blue-jay Plasters are made by Bauer & Black, the great surgical dressing house.

Try a Blue-jay Plaster now. Join the pain-free thousands who rely on Blue-jay.

Once you know Blue-jay, you'll never consent to have a corn again, nor to coddle it with temporary ways.

The cost is slight, the application simple.

Remember, we promise immediate relief and a defenseless corn.

Blue-jay Plasters are sold by all druggists—25c per package. Also Blue-jay Bunion Plasters.

B&B

Blue-jay
For Corns
Stops Pain Instantly—Ends Corns Completely

Large package 25c at Druggists
Small package discontinued

BAUER & BLACK *Makers of Surgical Dressings, etc.* Chicago and New York

We'll Send You a Lachnite —Just Send Your Name!

Don't send a penny. Just send us your name and address. We'll send a sparkling Lachnite Gem mounted in a solid gold ring, prepaid, right to your home. When it comes you merely deposit $3.75 with the postman. Wear the ring ten full days. *If you or any of your friends can tell it from a diamond, send it back.* Your deposit will be returned immediately. If you keep the ring you pay only $2.00 a month until $15.75 has been paid. Send your name now.

Write Today Tell us which of these solid gold rings you wish (ladies' or men's.) Give us the size of your finger.

Harold Lachman Co., 12 N. Michigan Ave., Dept. A119 CHICAGO

Don't Wear a Truss

Brooks' Appliance, the modern scientific invention, the wonderful new discovery that relieves rupture will be sent on trial. No obnoxious springs or pads.

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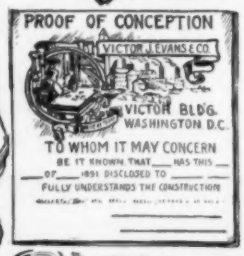

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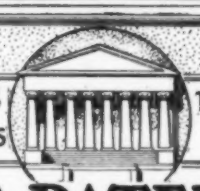

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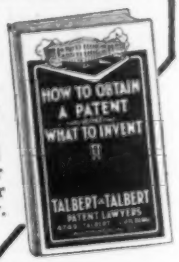

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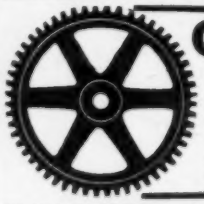

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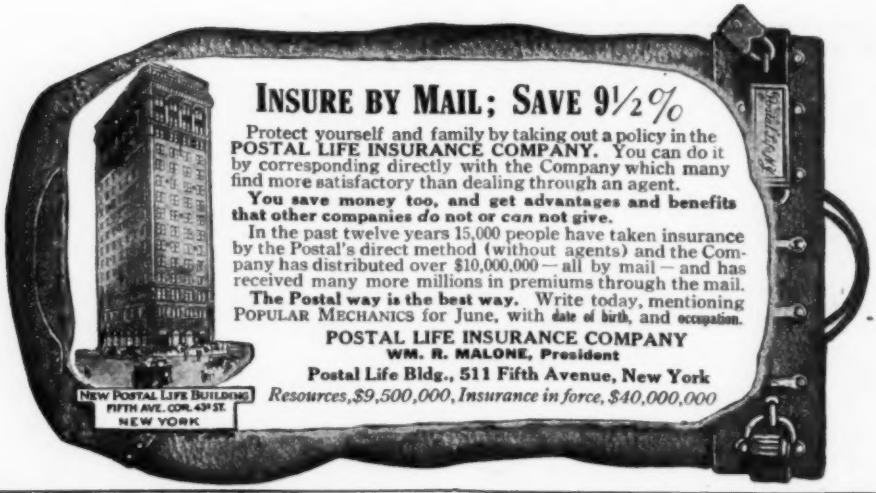

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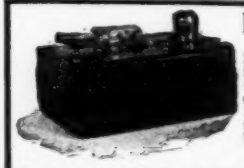

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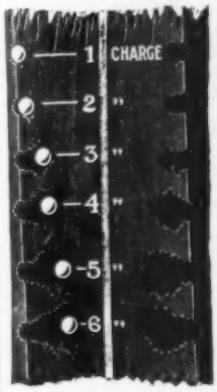

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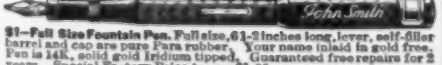

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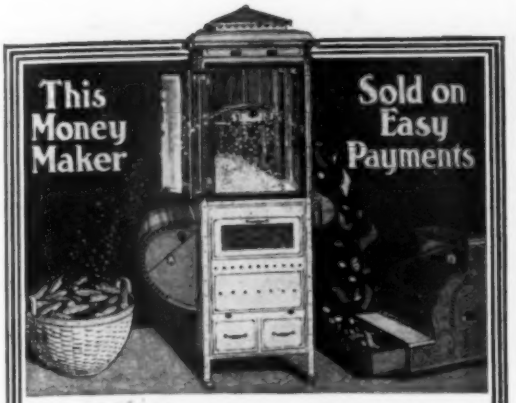

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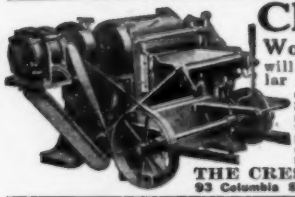

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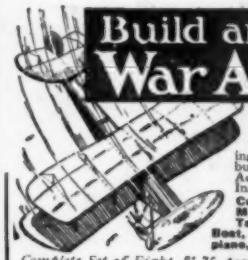

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of Popular Mechanics Magazine, published monthly at Chicago, Ill., for April 1st, 1918.

State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, who, having been duly sworn according to law, deposes, and says that he is the editor and business manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 6 No. Michigan Ave., Chicago, Ill. Editor, H. H. Windsor, 6 No. Michigan Ave., Chicago, Ill. Managing Editor, J. L. Peabody, 6 No. Michigan Ave., Chicago, Ill. Business Manager, H. H. Windsor, 6 No. Michigan Ave., Chicago, Ill. 2. That the owners are (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock): H. H. Windsor, 6 No. Michigan Ave., Chicago, Ill. 3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are (If there are none, so state): None. 4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

H. H. WINDSOR.

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(My commission expires June 17, 1920.)

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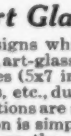

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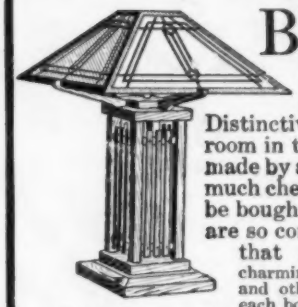

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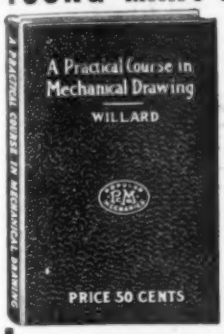

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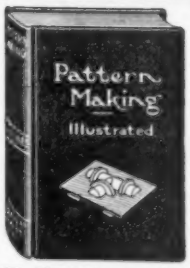

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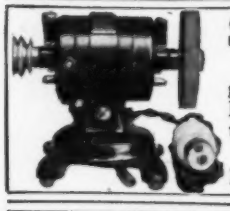

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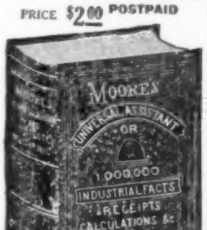

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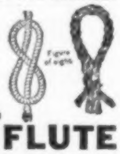

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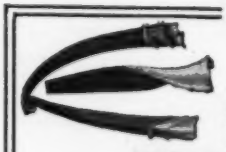

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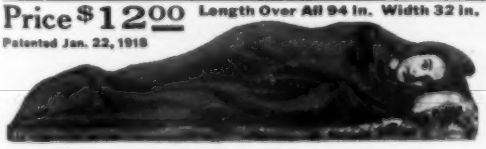

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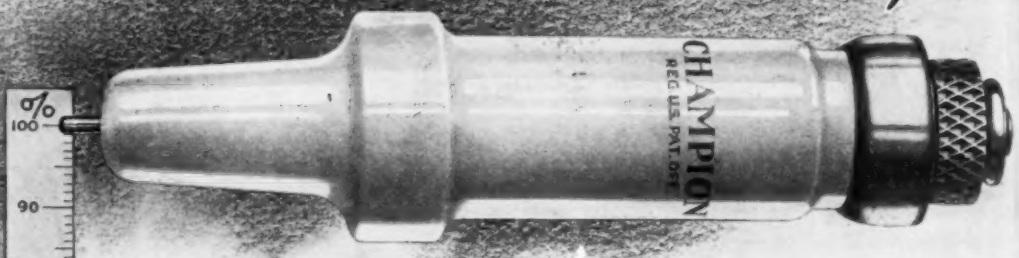

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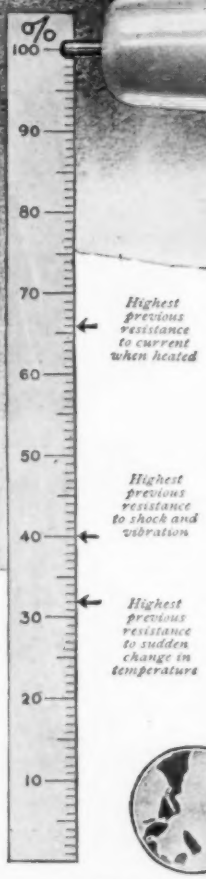

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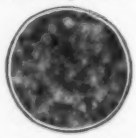
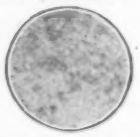
Cross-section of ordinary steel magnified 1000 areas showing coarse structure



Cross-section of highest quality steel magnified 1000 areas showing very fine, even structure

Cross-section of ordinary porcelain magnified 1000 areas showing coarse structure



Cross-section of Champion 3450 porcelain magnified 1000 areas showing very fine, even structure

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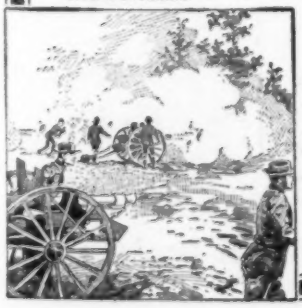

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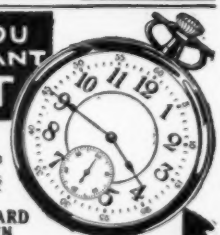

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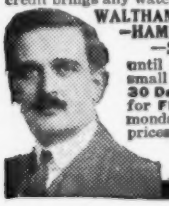

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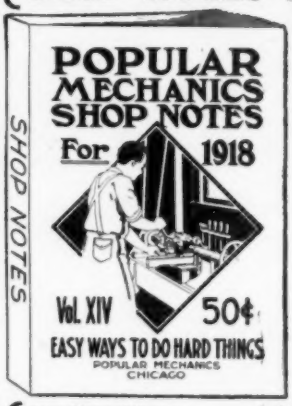

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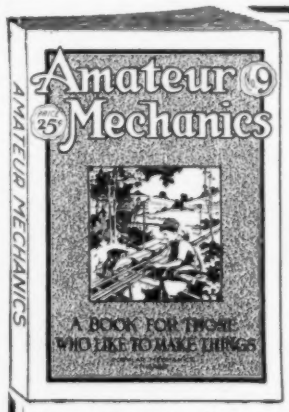

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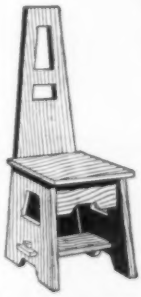

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Ambassador Gerard Denounces It Because It Would Help German Propaganda

Ambassador Gerard Said:

"*Now we have to meet this German Propaganda.* The war is not going to last forever—and you have seen what German Propaganda has done in Russia. These are grave dangers, and they only go to show what can happen in a country like Russia.

"*Fortunately, they cannot propaganda* this country as they can Russia, because we have great publications that go all over the country and have unified the whole country and the whole continent. *That is why I am against the postal zone law passed in the last Congress* putting an extra tax on papers sent from the cities where published.

"They forget that, whether these publications go from Philadelphia, from San Francisco, or from Chicago, it is the exchange of these papers from and to all parts of the country that makes one, universal, united America.

"They unify the sentiment, and that is worth far more in this war than the small amount of extra postage which the Government will obtain."

THE newspapers and magazines of this country are the chief educational agencies of our nation, and as such of supreme importance in our principles of Government. The widest possible circulation of publications ought to be facilitated as a wise public policy.

The postal "zone" system was abolished by Abraham Lincoln in 1863 and has since been condemned by Postal Commissions and postal experts. Such a law was denounced by President Wilson when he was governor of New Jersey.

There is a direct relationship between wide reading, accessibility of information—and effective patriotism. Reading should be encouraged—and the history of our postal development from George Washington to the present proves this. This is what George Washington said:

"But here I cannot forbear to recommend *a repeal of the tax on the transportation of public prints.* There is no resource so firm for the Government as the affections of the people, guided by an enlightened policy, and to this primary good nothing can conduce more than a faithful representation of public proceedings, diffused without restraint throughout the United States." (George Washington's Message to Congress, December 3, 1793.)

WIDESPREAD opportunity of reading means efficient patriotism—it is proved by facts. Could any fact be of greater significance than the following:

When the recruiting of American soldiers for this great and righteous war was begun, each State was allotted a certain quota of enlistments. One year after eight States *failed* to complete their quotas—and six of these are from States showing the *highest percentage of illiteracy in our entire country:*

	Per cent of illiteracy by last census
Arkansas	12%
Louisiana	19%
Mississippi	22%
North Carolina	18%
South Carolina	25%
Virginia	15%

In those States there is no magazine circulation to speak of.

And this postal "zone" law would kill magazines and restrict their circulation in the greatest crisis that has ever confronted this nation since the American Revolution.

Repeal this law.

Our postage on magazines is FOUR times the Canada rate. Our Congress has increased magazine postage by 50 to 900 per cent through a "zone" system—and during the greatest crisis this nation has ever faced.

Canada has raised postal rates during the war on every class except newspapers and magazines. Canada recognized the vital need of widespread reading to help win the war.

Our Cougress has passed a law to throttle reading during the war and after it by this postal "zone" system. Demand its repeal—at once.

Restrict periodical reading and you aid German propaganda—read Ambassador Gerard's condemnation of this same postal "zone" law.

Oppose this law. Write to your Senators and Congressmen against this disastrous postal "zone" law—and demand its repeal. Get your friends and family to write. Circulate a petition demanding its repeal.

Read Ambassador Gerard's word once again. Enroll to fight this disastrous postal "zone" law and if you will help, you have helped—by discussion, by letters to Congress, by petition—send your name at once to CHARLES JOHNSON POST, 200 Fifth Avenue, New York City.

"That's the tire for me"

"It has the stuff in it that means mileage.

"How do I know? Say!

"Do you see that name, United States? I've had several United States Tires with different treads and they're all good, believe me.

"I've never seen the United States Tire that didn't stand up.

"This chain tread is the one I like best. It's fast and easy and that chain sure does hold the road."

Every boy who rides a bike will find the tire for him among the twelve different United States Tires. A tread and construction to suit every person, every purpose, and all

United States Cycle Tires are Good Tires

Ask your tire dealer to give you a United States Tire Book showing all styles of United States Tires for Bicycles and Motorcycles. It has a lot of other interesting pictures and reading in it, too. Three popular Bicycle Tires are Chain Tread, white walls with black rubber tread, Heavy Service Traction Tread, all white with motorcycle fabric and herringbone non-skid tread, and Cord Tire, made in the same manner as the famous 'Royal Cord' Automobile Tire. Ask to see them at your dealers.

Be Sure It Is United States

52 GOOD REASONS WHY YOU SHOULD OWN A WITTE HIGH GRADE ENGINE

Let Me Send You a WITTE Direct From Factory to Earn Its Own Cost—Prove Its Merit. Read My Latest Offer—Then Write for the Complete Story. It's Free, Postpaid.

This is my **31st successful year** in the engine business. Starting in a small shop with my first engine built with my own hands, I now own and operate the largest exclusive engine factory in the world, selling direct to the user. The reason I have been successful is because I make a better engine at a better price—**give prompt service**—do as I agree. You can buy your WITTE Engine direct from my factory at a saving of **$15 to $200**—get it quicker—have economical, easy-to-use power at a fair price, just as others are doing. My first engines are still doing good service—you get the improvements I have made in 31 years, and I guarantee the engine you select for 5 years from date of purchase—long enough to earn its cost five times over.

HERE IS MY BEST ENGINE OFFER

I will sell you a WITTE Engine on Practically Your Own Terms—Cash—Payments—or No Money Down. 5-year Guarantee—Money Back If Not Satisfied on My New 90-Day Engine Offer. Write for my New Book Showing How WITTE High-Grade Engines Are Built—Why They Are Better—and Why I Can Make You The Best Price. I want you to read this book whether you buy my engine or not.

ED. H. WITTE.

WITTE ENGINES

Built in Standard Sizes—2, 3, 4, 6, 8, 12, 16 and 22 H-P. Stationary, Portable and Saw Rig Styles, to Operate on Kerosene, Gasoline, Distillate and Similar Fuels

WITTE Engines have **big surplus power.** They are simply and strongly made, easy to understand, easy to operate. With a WITTE Engine on your farm, you can do your work easier, quicker and better—make more money. Hundreds and thousands of farmers and ranchers in every state are using WITTE Engines. They are making money—why not you? Try my engine, **on its merits—not on the price.** You can't get a better built engine for the price than I will sell you direct—**all complete, tested and ready to run**—no extras to buy—all the latest WITTE improvements—an engine that anyone can operate—built for practical, every-day hard work, durability and long life. The proof is a trial on your own work.

WRITE for my new, **Free,** copyrighted book, **"How to Judge Engines".** Learn why it pays to deal with an exclusive manufacturer direct—why I can give you the most engine value for your money, and the most favorable terms.—ED. H. WITTE, Pres.

WITTE ENGINE WORKS

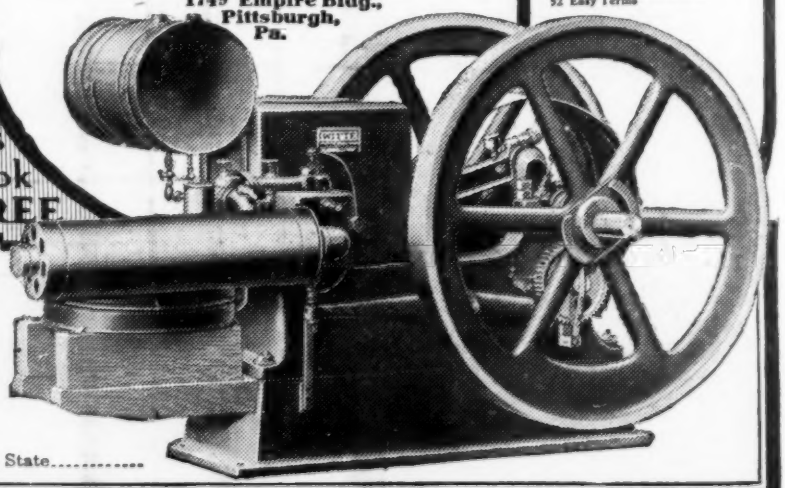
1749 Oakland Ave., Kansas City, Mo.

1749 Empire Bldg., Pittsburgh, Pa.

52

1 Uses Fuel Only as Needed
2 Detachable Cylinder, Semi-Steel
3 No Wear, Vertical Valves
4 Large Open-Top Hopper
5 No-Leak Combustion Chamber
6 Automatic Fuel Mixer
7 Water-Cooled Valve Pocket
8 Non-Slip Fly-Wheel Hubs
9 Spark Plug Between Valves
10 Larger Water Space
11 Long Trunk Piston
12 4 Semi-Steel Piston Rings
13 Bronze Bushing on Piston Pin
14 Self-Lubricating Piston
15 Heavy I-Beam Connecting Rod
16 Finished and Polished Cranks
17 Self-Timing Attachment
18 Noiseless Cut Steel Gears
19 Spark Advancer and Retarder
20 Fuel-Saving Governor
21 Oil and Gear Shields
22 Massive Bed Construction
23 Powerful Side Lever
24 Extra Wide Bearings
25 Automatic Fuel Valve Lock
26 Adjustable Air Damper
27 Use Pulleys on Either Side
28 Automatic Preheating of Fuel
29 Full-Length Base
30 Water Drain from Hopper
31 Turned Fly Wheels
32 Greater Piston Push
33 Better Engine Design
34 Big Surplus H-P.
35 Standard Sizes
36 Easy, Silent Running
37 Built by Experts
38 Guaranteed 5 Years
39 Adjustable Bearings
40 High-Grade Materials
41 High-Grade Finish
42 Easily Removable Pistons
43 Self-Oiling Piston Pin
44 Automatic Ignition
45 Removable Valves
46 No Interior Packing
47 Battery or Magneto
48 Kerosene or Gasoline
49 Engines Ready to Run
50 Parts Easy to Get At
51 Simple in Construction
52 Easy Terms

This Book FREE



(1749) **MAIL This Coupon**

This coupon (or a postal request) entitles you to my new 90-Day **Engine Offer** and Free Book, **"How to Judge Engines"**

Name.....

Town..... State.....

The Old Way

Factory
Branch House
Salesman
Agent
You

Two Ways of Selling THE OLIVER Typewriter

The New Way Saves You $51

The New Way

Factory
You

The Old Way: **It cost $51 to sell you a typewriter. Rents of offices in 50 cities, salaries, commissions and other costly practices—each demanded its share.**

The New Way: **We ship direct from the factory to you, eliminating all middlemen. This saves the $51, and it now goes to you. A $100 Oliver costs you but $49. Why waste $51 by buying typewriters the old way?**

These Facts Will Save You Money

NOTE that this advertisement is signed by The Oliver Typewriter Company itself. It is not the advertisement of a concern offering second-hand or rebuilt Olivers of an earlier model. The Oliver Typewriter Company makes only new machines. The entire facilities of its factory are devoted to this one purpose. And our new way of selling has caused us to build new additions to this factory.

The old way, as explained above, was wasteful and wrong. So people have welcomed our new economical plan and our output has multiplied.

We offer for $49 the exact machine which formerly sold at $100. This is our Model Nine, the finest typewriter we ever built. It has the universal keyboard, so any stenographer may turn to it without the slightest hesitation and do better work more easily.

And it has dozens of superiorities not found elsewhere. For instance, it has 2000 fewer parts. This means longer wear, and naturally few or no repairs.

This Oliver Nine is a 20-year development. If any typewriter is worth $100, it is this splendid model.

It is the same machine preferred by great concerns such as United States Steel Corporation, Baldwin Locomotive Works, National City Bank of New York, Pennsylvania Railroad, Otis Elevator Company, and hosts of others. Such concerns demand the best. Yet they are not wasteful.

FREE TRIAL

Merely clip the coupon below, asking us to send a free trial Oliver. We do not ask a penny down. When the Oliver arrives, try it out. Put it to every test. Compare its workmanship.

Then, when you are convinced that the Oliver Nine is all we claim, and you prefer it, pay us at the rate of $3 per month.

During the free trial, you are not under the slightest obligation to buy. If you wish to return it, we even refund the transportation charges.

Used typewriters accepted in exchange at a fair valuation.

Or, if you would rather know more about our plans before ordering a free-trial Oliver, check the coupon for our amazing book entitled, "The High Cost of Typewriters — The Reason and the Remedy." We accompany it with our beautifully illustrated catalog describing the Oliver Nine.

Cut out the coupon now and check it instead of waiting until later.

Was $100

Now $49

Canadian Price, $62.65

Mail Today

The Oliver Typewriter Co.
1096 Oliver Typewriter Building
Chicago, Ill.

Act Quickly—While This Price Lasts

THE OLIVER TYPEWRITER COMPANY
1096 Oliver Typewriter Bldg., Chicago, Ill.

☐ Ship me a new Oliver Nine for five days free inspection. If I keep it, I will pay $49 at the rate of $3 per month. The title to remain in you until fully paid for.

My shipping point is.....

This does not place me under any obligation to buy. If I choose to return the Oliver, I will ship it back at your expense at the end of five days.

☐ Do not send a machine until I order it. Mail me your book—"The High Cost of Typewriters—The Reason and the Remedy," your de luxe catalog and further information.

Name .....

Street Address .....

City..... *State*.....

Get This Car

and the Agency in Your Territory

The World's Greatest Motor Car Value

114 Inch Wheel Base—36 H. P. Motor—Unit Power Plant—Full Floating Rear Axle

Write NOW for Full Specifications of

BIRCH SUPER-FOUR

Find out how you can get one of these superb cars for yourself and save money selling them to others. Hundreds of cars will be sold this year in every county in the United States. Millions of dollars will be paid to automobile agents. We pay big commissions for selling Birch Cars. Don't miss this opportunity. ***Send the coupon now for full information.***

Here Are a Few of Our Agents — Ask Them

L. W. TROUT	Eldorado, Ill.
LOICE YOUNG	Swifton, Ark.
R. G. MOORE	Mt. Vernon, Ore.
M. M. JACOBSON	Safford, Ariz.
W. R. WALKER	Fitzgerald, Ga.
OTTO C. MUELLER	Columbus, Neb.
J. H. CONNATSER	Celeste, Tex.
J. D. FARMER	Anthon, Iowa
GARNER & LANNING	Minden, La.
A. V. SPILLMAN	Melbourne, Mo.
H. M. THOMAS	Bellwood, Pa.
A. H. CHRISMAN	Danville, Ky.
F. O. MARTIN	Marianna, Fla.
ERNEST BIRCH	St. Anthony, Idaho
E. R. POOR	Bozeman, Mont.

What New Mexico Agent Says:

"I received my car all O. K. It's the finest looking car in the country and suits me better than any car I ever saw. Lots of men have looked at the car and they said it had the finest motor they ever saw on a car. Some have asked me if the car didn't cost $1,000 or $1,200."

R. R. REAGAN, Boaz, N. M.

We can name only a few here but will send names of many others when you write us. We want you to see one of our cars and ride in it if possible. When you do this we know you will be enthusiastic about the Birch and about selling the Birch cars in your locality.

Drive a new 1918 Model Birch Super-Four. Pay for it out of your commissions on sales and make good money selling Birch Cars to your friends and neighbors. Probably you know right now from six to ten people who will buy automobiles in the near future. Make some of these sales yourself. **Get our proposition quick.**

Birch Agents Are Making Money

One of our Texas Agents sold two carloads of Birch Cars within 60 days after he received his first demonstrating car. There is no reason why you cannot do as well. Every sale means a big commission for you and the Birch is such a wonderful car for the money that it practically sells itself.

Whether you own a car or not, get our great offer. *Mail the coupon in the lower left hand corner right now for big free booklet and full information.*

Be the Birch Agent in Your Locality

Cash in on the demand for a strictly high-grade, light-weight, fully equipped motor car, that exists right now in your vicinity. You have the customers. We have the cars. Let's get together. Hurry in the coupon!

Previous Experience Not Necessary We want men of character and ability and high standing. Previous experience not necessary. **We require all our agents to take a brief but thorough course of training in Automobile Driving, Repairing and Selling which will fit them to represent us in a manner creditable to us and profitable to them. We have trained hundreds of others for success in this way, and we believe this is one of the reasons for the splendid success which the Birch Agents are enjoying.** But of course the BIG REASON is the cars themselves and the remarkable records they are making in the hands of satisfied owners all over the United States. Eighty per cent of all Birch cars are in use by farmers and in small towns, and get the hardest kind of service. Mud, sand, rocks, hills and rough going have no terrors for these sturdy cars. Don't delay. Send the coupon today—RIGHT NOW!

FREE Coupon

Ralph Birchard Pres.
BIRCH MOTOR CARS
81 East Madison St.
Dept. 619 Chicago

Please send me your big free booklet and full particulars as to how I can get a **Birch Super-Four** and the agency.

NAME .....

ST. NO. OR R. F. D. .....

P. O. ..... STATE .....

Please Write Plainly

Tear Off and Mail Coupon Now!

FREE BOOK!

Send for FREE BOOK and Full Information

Mail the coupon at once. We have agents in every state in the Union now, but we want an agent in every county. You will be astonished at the liberality of our offer. Let us put all the facts before you at once. It costs you nothing to investigate, so tear off coupon right now. SIGN IT AND MAIL IT TODAY.

Ralph Birchard Pres. **BIRCH MOTOR CARS** 81 East Madison St. Dept. 619, CHICAGO

MEMBER CHICAGO ASSOCIATION OF COMMERCE

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